The
Electrical Review

VOL. CX. FEBRUARY 5, 1932. No. 2828.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
Not Satisfied	181
Efficiencies and Costs, by R. S. H.	183
Electric Signs and By-laws	184
The Trolley Bus, by Henry Watson	186
Long-distance Telephony, by Paul Frick (illus.)	187
Turbine Oils, by A. B. Owies	189
Empire Broadcasting	190
Varied Engineering Developments (illus.)	191
Plastic Mouldings (illus.)	192
Meetings and Discussions	193
Flux-covered Welding Electrodes (illus.)	196
Correspondence:—These Discounts; Still the Boiling Plate; The Installation Problem; Jerry Wiring	197 & 198
New Apparatus and Devices (illus.)	199
Dietetics in the Stores, by H. R. Taunton	201
The Contractors' Dinner	202
Business and Industrial Notes	203
Electricity Supply	206
Traction	208
Communications	208
Contract Information	209
Forthcoming Events	210
Notes	210
Our Personal Column	211
Legal	212
New Companies Registered	212
Returns of Electrical Companies	213
City Notes	213
Stocks and Shares	214
Published Specifications	215
New Work for Contractors	216

Not Satisfied

WE had Mr. W. R. Rawlings's assurance at the E.C.A. dinner last week that the contractors are not pleased with things as they are. In this they are not alone. Who in the electrical industry can be satisfied until there is greater unity of purpose, co-operation, and a general speeding-up of progress?

It remains to consider how far the contractors themselves, in common with all other sections, are responsible for existing conditions, and to what extent the remedy lies in their own hands.

The contractors were the first section of the industry to organise themselves for their common good, and their Association has weathered the storms of the past thirty years with remarkable success. But because their calling is one which is open to anybody with a pair of pliers the full fruits of co-operation have been denied them.

And who cares? Not the supply authority whose business is to sell electricity, nor the public which wants a cheap job. Neither minds how the goods are delivered so long as they are respectively sold and obtained. The manufacturers and wholesalers examine only the financial standing, not the technical qualifications, of their contractor customers.

We speak in general terms, of course, for the general indifference is leavened in many places by enlightened supply authorities and an intelligent public.

What can the contractor do about it? Well, in the first place, it would seem that the E.C.A. is stronger in the head than in the limbs. The Council possesses some of the best brains and most active men in the industry, but by the time their beneficent influence penetrates to the uttermost parts of the country it is somewhat attenuated.

In some towns the Association spirit is strong and the contractors are a potent force. They are thus able to come to terms with the supply authority and to educate the public, with good results all round.

It cannot be said that this is generally true, however, for there are many places in which the E.C.A. is practically unknown. We have in mind one town with over 30,000 inhabitants and a progressive and successful undertaking where the Association can boast only one member, who, incidentally, is also the only registered contractor in the town.

This is not an isolated instance, and it looks as though more missionary work might do a great deal of good.

Compulsory registration is advocated by the E.C.A., but desirable as that may be are they sure of the unqualified support of the other sections of the industry which is a pre-requisite to legislation on these lines?

We are aware that all sections back the National Register, but when it comes to legislative compulsion some of them may regard matters in an altered light.

A Standard Installation

THE President of the E.C.A. repeated his conviction (expressed recently in his article in the ELECTRICAL REVIEW) that a standard installation with a liberal supply of outlets is needed. This is another very desirable consummation, but here, again, the question of cost is insistent. Only such an installation can give the consumer the full service of which electricity is capable; but what of those who want electric light only and should be snapped up as likely customers for "other uses" later on? Even assisted wiring schemes won't get over that difficulty. Supply engineers would strongly encourage such a standard installation, but would refuse to consider it

to the exclusion of less adequate, but possibly remunerative, installations. It would cost money, and there lies the issue between the contractor and the supply authority. The former maintains that development is retarded by the high price of energy, while the latter puts the blame on to high installation costs. Mr. Rawlings claims that a 24-hour load could be satisfied at less than a farthing per unit. No doubt the supply engineer will retaliate by saying that if the contractors liked they could (with the aid of suppliers of materials) put in wiring at 10s. a point or less. It all goes to show that co-operation, except in a very few places, is far from being an accomplished fact. Until there is complete unity and a policy is hammered out the public education will be neglected, and although "units sold" will continue to increase, the electrical age will remain a dream of the future.

£7,000,000

EARLY in the week the Central Electricity Board asked the public to take a further £7,000,000 of its five per cent. stock to rank *pari passu* with the £19,000,000 of the same stock previously issued. The price of issue was 95. As every electrical man knows, the operations of the Board are constantly growing, and the stock is a first charge on the whole of its undertaking and net revenues. If everybody in a position to do so helps forward the applications of electricity, there need be no question about the capital being profitably employed, both in a national and in an individual sense. It is stated, however, that the "Market" did not expect so large an issue at the moment.

Extensions at Birmingham

WHAT the growth of the domestic demand and of existing factory installations means to manufacturers is obvious from the news published from week to week in our "Electricity Supply" pages. To-day we report the proposed capital outlay for the next eighteen months upon the distribution system of the Birmingham undertaking. Between now and September, 1933, £500,000 will be expended upon general mains extensions, and £200,000 upon sub-station buildings and plant, kiosks, switchgear and transformers on consumers' premises. The Department had a similar amount voted a year ago, but this will be exceeded by the end of next month, because there has been a quite abnormal increase in the number of premises connected up recently. The progress made by the undertaking during the past five years has been very striking. The outlay during the next 18 months may not come up to that of the preceding 15 months, due to reduced costs. The average annual outlay for the past five years has been £533,000. The standardisation of frequency programme is proceeding satisfactorily. It has now become necessary to acquire an additional 129 acres of farm property adjacent to the Hams Hall generating station.

Electrical Retrenchment

SEVERAL weeks ago (ELECTRICAL REVIEW, January 8th, p. 63) we reported that Nottingham had been receiving 1,500 applications per month for supplies under its two-part tariff scheme. Over 15,000 houses had been connected under the assisted wiring plan and 4,000 applications were outstanding. Hire-purchase principles were attracting domestic consumers, and demand for industrial power was also progressing. A week later it was reported that nearly £116,000 was to be spent upon mains and services; £23,000 on machinery; £43,000 on meters; £53,000 on assisted wiring, and £15,000 for apparatus—altogether £250,000. But all these evidences of progress in a profit-earning undertaking have attracted the attention of a committee which has been looking round to see what retrenchment measures can be introduced in municipal expenditure, and it has cut down the Electricity Department by £22,500—a postponement, it is called.

Assisted Wiring

OUR report does not state which of the items mentioned is affected, but there is a further proposal that, in the absence of fuller information, we must regard as short-sighted. It is a recommendation to the Electricity Department to go slow with its assisted wiring scheme! Surely it is such schemes as this that are likely to be more popular with the public when it has less money to spend; they can be made quite profitable if properly conducted; the Electricity Authorities favour the idea; and, altogether, economy in such a class of development is unwise.

The Cover of the "Review"

READERS of the ELECTRICAL REVIEW may have noticed a change in the outward appearance of the paper this week. In place of some five-and-twenty small advertisements on the front page, a single large one is substituted; and other readjustments of the type have been made to give what we trust will prove a more effective cover. The value of the conspicuous advertising position which this provides was at once recognised by many of the leading firms in the industry, who will have it in succession; so that we are able to start off with the space definitely allotted for more than a year ahead.

The Mechanical Basis

THE need for the electrical engineer to undergo a sound mechanical training is evident in all his works. The most conspicuous instance is probably in power station work, but the influence is no less great in the field of traction. We agree with Mr. J. D. Twinberrow in the implication contained in the paper which he read before the "Mechanicals" that in the application of electricity to railroad traction many of the most important problems encountered are electrical in only a secondary degree. There was at one time a tendency to accept the steam locomotive (with certain modifications), because of its good performance as such, as the only possible model for the electric tractor. Experience in meeting the requirements of main-line electrification in many parts of the world has shown the need for a thorough consideration of the fundamentals, and the results of this experience are embodied in current British construction.

Fog

IT is disappointing to learn from the report on atmospheric pollution issued this week that there has been no material improvement in the London atmosphere during the past decade. This finding is contrary to the common opinion that the increasing use of substitutes for coal in the home and factory should have made a notable improvement, both in the quantity and quality of deposit and in the density of fogs. The latter, we are told, depend chiefly on the uncontrollable factors of wind and temperature, and reduction in the rate of smoke emission merely causes delay in the formation of a fog. The lesson to be learned from this is, surely, that everything should be done to prolong the delay indefinitely. Thus, one of the chief causes of the favourable atmospheric conditions found in such an important industrial town as Coventry, according to the same report, is that "electricity is very cheap here, and all large factories use it for power purposes."

Remote Control

IT is reported that the foundation stone of the new Freemason's Hospital at Ravenscourt Park is to be laid from a distance of two miles by electrically synchronising the movements of the stone with those of a duplicate at Olympia. This is only a minor electrical feat, but it will provide a spectacular demonstration of what is the chief factor in developing the uses of electricity. The point that it emphasises is that it is not so much the number of kilowatt-hours that can be obtained from so many British thermal units that will count in the long run, as the fact that electricity will do things better than anything else can.

Efficiencies and Costs. By R.S.H.

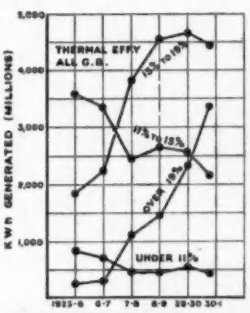
The increased need for better load factor

FROM the point of view of electricity supply, as from other points of view, the London and Home Counties area differs substantially from any other large area. During the past few years the rate of progress as regards sales and revenue has been very much greater.[1] In the accompanying graphs are set out the more important average costs for the country as a whole, and the comparative averages for the London area and for the other areas of Great Britain separately.

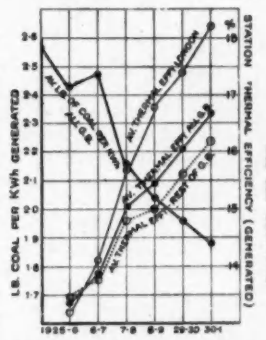
The figures have been derived from the published returns of the Electricity Commission and the London Joint Electricity Authority—which, incidentally, call for careful handling if misleading results are to be avoided—and have been compiled on the basis of those adopted on a previous occasion.[2] In one or two cases, however, comparable figures for the London area are not available.

The first three graphs relate to the cost of fuel. Fig. 1 shows that the total output of all steam stations in Great Britain at the two lower groups of efficiencies has more or less steadily declined, that the output of the third group (15 per cent. to 19 per cent.) at first increased but has been roughly stationary for the last three years, while the output at the highest efficiencies has rapidly and continuously increased.

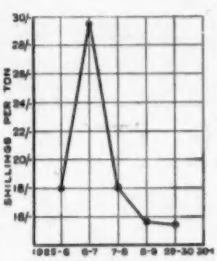
It can also be seen that the same is true of the London area and the rest of Great Britain taken separately, except with regard to the 15 per cent. to 19 per cent. class; in this case the output in the London area has substantially declined during the past two years, but in the rest of Great Britain has continued to increase.



KWh generated at various ranges of station efficiency


LB. COAL PER KWh GENERATED
STATION THERMAL EFFICIENCY (GENERATED)
ALL G.B. COAL PER KWH
ALL G.B. THERMAL EFFY
LONDON THERMAL EFFY
REST OF G.B. THERMAL EFFY
1925-6 6-7 7-8 8-9 29-30 30-1

Average thermal efficiency and coal consumption



Figs. 1, 2 and 3

Average cost of coal at generating stations (all Great Britain)

Coal Consumption

The second graph shows average coal consumption and corresponding steam-station average thermal efficiency for Great Britain as a whole, together with the average efficiencies for the London area and the rest of Great Britain separately. By "average station efficiency" is meant the ratio of total electricity produced against total heat used, and not a simple arithmetic mean of the efficiencies of the stations concerned.

It will be observed that the average efficiency is rising much faster in the London area than in the rest of the country; this is due, no doubt, to the higher proportion of new plant installed during the period to meet the higher rate of increase in output and to supersede old plant which was due for scrapping. The line for actual coal consumption makes no allowance for variation in the average calorific value of the coal used from year to year; for Great Britain as a whole the average gross calorific value in B.th.u. per lb. moved roughly as follows:—1925-26, 10,500; 1926-27, 9,920; 1927-28, 10,540; 1928-29, 10,840; 1929-30, 10,830; 1930, 10,880. There was thus no important change in the average calorific value in this period except for the year of the dispute in the coal industry, although we know that for individual stations the value may lie anywhere between 8,000 and 14,000 B.th.u.

Thermal Efficiency

As regards heat efficiency, the application of the average system efficiency (the ratio of kWh generated to kWh sold) to the corresponding generator thermal efficiency shows that the percentage of the heat in fuel fired in steam stations which reached the final consumers' terminals in the form of electrical energy moved roughly as follows:—

	1925–6.	1930.	Saving in heat. per kWh.
All Great Britain	10.8	13.6	20%
London	10.5	14.7	29%
Rest of Great Britain ..	10.9	13.2	18%

The average station thermal efficiency set out in the second graph should be compared with the efficiency of the best station year by year, which moved as follows:—

1925–6	1926–7	1927–8	1928–9	1929–30	1930
21.5%	21.8%	21.1%	21.4%	24.4%	23.8%
Barton.			Padiham.	Kearsley.	

The lower average cost of coal at generating stations, which is indicated in fig. 3, may be due to: (*a*) lower prices at the pithead, corresponding to lower costs in the coal mining industry; (*b*) lower prices at the pit head, due to the purchase of larger quantities; (*c*) lower transport costs from the pit to the power station; and (*d*) greater proportionate use of a commercially inferior grade of coal for which the demand in relation to the supply available is low (*e.g.*, riddlings or washings as used in pulverised plant). The relative importance of these factors is unknown, but no doubt in the London area the reduction in transport costs has been particularly important and has been obtained by closing down ten of fifty steam stations, by concentrating the output on the better placed of the remaining stations, and by the increased use of waterborne coal.

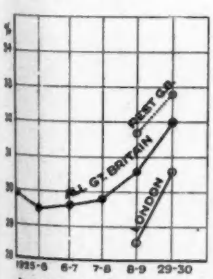
London's Progress

The data given in figs. 2 and 3 in conjunction with average system efficiency give the average fuel costs per kWh sold to final consumers as set out in figs. 7 and 8. Unfortunately all the comparable figures for the London area are not available, but a striking feature is the greater rate of progress in that area.

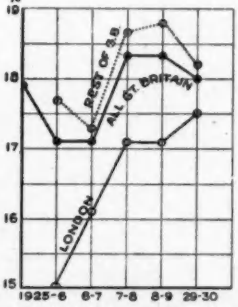
As shown above, in the period under review the heat consumed per kWh sold to consumers decreased by 29 per cent. in the London area as against 18 per cent. in the rest of Great Britain. Similarly, the cost of coal per kWh as shown in fig. 8 decreased by 41 per cent. in the London area, as compared with a decline of only 28 per cent. for the other parts of Great Britain.

This can be taken to mean that the average cost of coal per ton at London stations fell 18 per cent., as compared with about 13 per cent. at stations in the rest of the country; in the later years the actual average cost of coal per ton in London was about 29 per cent. above that for the rest of the country, as compared with 38 per cent. at the start of the period (1925-26).

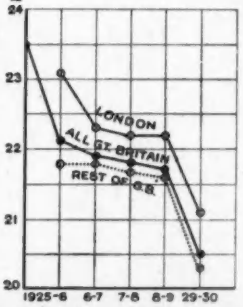
Figs. 4, 5 and 6



Load factor on generator maximum demand



Load factor on installed capacity



Capital expenditure per kW of generating plant

Improved Efficiency and Wages

There is available for Great Britain as a whole, but not for the London area separately, the total amount expended annually on salaries and wages for operation and maintenance for generation and distribution taken together. The actual cost per kWh sold is shown in fig. 7; during the past four years it has fallen about 19 per cent., but, with the growth of sales, the total amount expended annually has grown by about 25 per cent. and the total number of employés by about 36 per cent., so that in this industry "rationalisation" has not led to a smaller wages bill, less employment, or a lower "real" average wage. Indeed, there is evidence that it will have the opposite effect.

D

[1] ELECTRICAL REVIEW, June 26th, 1931 (p. 1085).

[2] ELECTRICAL REVIEW, August 22nd and 29th, 1930 (p. 293 and 333).

During the past three years the cost of fuel and of salaries and wages, together with the cost of local rates, has amounted to about 75 per cent. of the revenue account expenses as understood in connection with electricity supply accounts. The other expenses consist mainly of the cost of materials other than fuel and of rents.

Poor Plant Load Factor

Figs. 4, 5 and 6 relate to factors affecting generation capital charges. Fig. 4 shows the average load factor based on maximum demand on generators in which clearly there has been a very definite improvement during the last two years. Fig. 5 shows the load factor based on the total installed generator capacity; the figures are those shown in fig. 4 varied according to the proportion of spare plant at peak load. These draw attention to a most deplorable state of affairs; the actual output in any year has not once reached 19 per cent. of what the plant installed could give if fully and continuously loaded! No doubt some of the plant is poor and is of use only over short peak loads, but there certainly is room for a reduction in spare plant and for the development of supplies off the winter peak.

Figs. 7 and 8.—Average costs per kWh sold
All Great Britain **London and rest of country**

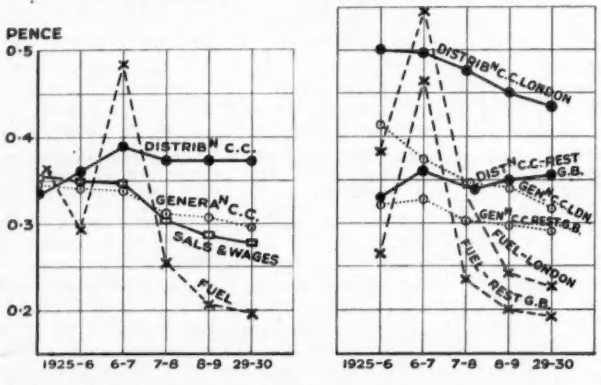


Fig. 6 shows the average original capital expenditure per kW of generating plant. The average cost in London is definitely above that in the rest of the country, but in the period for which figures are shown it has fallen nearly 9 per cent. as compared with 7 per cent. for the rest of the country. Capital charges per kWh sold on generation capital expenditure assuming 5 per cent. interest and 2¼ per cent. annual depreciation on the full original capital expenditure, are set out in figs. 7 and 8. Although the actual figure remains higher it will be observed that generation capital charges per kWh have fallen more rapidly in the London area than in the rest of the country, the respective decreases being 23 per cent. and 10 per cent. of the 1925-6 figure.

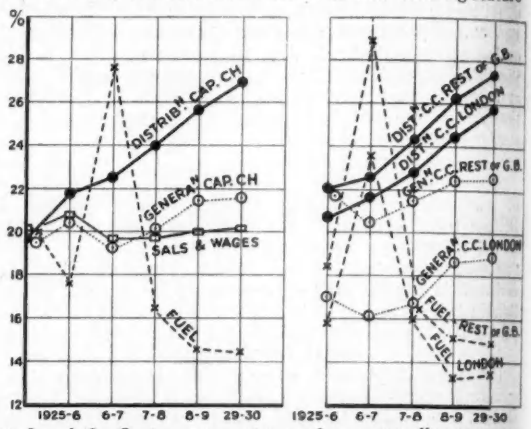
Figs. 7 and 8 contain in addition to the cost of fuel, salaries, and wages, and generation capital charges, the average cost per kWh of capital charges on transmission and distribution systems with interest at 5 per cent. and sinking fund at 2¼ per cent. on the original capital expenditure. In this case the cost has fallen 13 per cent. on the 1925-6 figure in London as against an *increase* of 9 per cent. for the rest of the country; here also the actual figure is still considerably higher in the London area.

This increase is no doubt due to the much higher rate of increase in the domestic load and the lower rate of increase in the power load which has been experienced outside London during the past few years,[1] for domestic supplies involve a higher distribution capital expenditure, particularly as they are given entirely off low-voltage systems.

Special Conditions in London

The fact that the actual average cost of distribution capital charges is higher in London than elsewhere is no doubt attributable to the lower average load factor, the higher proportion of underground mains, and the lower proportion of energy sold at higher voltages.

In figs. 9 and 10 the actual costs as shown in figs. 7 and 8 are set out as percentages of the corresponding revenue from the sale of electricity to final consumers. The most striking feature



Figs. 9 and 10.—Costs as percentages of corresponding revenue: All Great Britain; London and rest of country

is the fact that owing to the rate at which the average revenue has fallen the percentage of the revenue absorbed by distribution capital charges year by year has increased rapidly and continuously. Secondly, it will be observed that for all three expenses shown in fig. 10 the percentage figure is higher for the rest of Great Britain than for the London area, although the actual cost is lower. This means that a higher proportion of the actual revenue in the London area goes to meet expenses other than those here set out, and investigation suggests that it is due to a higher rate of capital remuneration than has been assumed in this article, and to the appropriation of a larger proportionate amount for capital extensions.

Electric Signs and By-laws

THE development of the modern sign industry has meant a great deal to the electrical trade, for the illuminated sign is to be seen in almost every street of almost every town. This is all to the good, but the consumption of electricity, the sales of electrical fittings, and the general improvement in the electrical trade would be phenomenal if certain foolish restrictions on signs could be removed.

The box sign, which projects from a wall and can be read from both sides, is one of the most useful of modern illuminated signs. It contains one or two lamps according to size, and is usually alight long after shops are closed. Unfortunately nearly every town has antiquated by-laws which restrict the size of projecting signs of this nature.

The position is complicated by the very large difference in various towns. Thus in Nottingham a sign may project 33 in., in Manchester only 8 in., in Birmingham 12 in., and in Blackpool 24 in. In Birmingham the by-law regulating projecting signs was passed in 1883, nearly 50 years ago, when conditions were altogether different from what they are now and when bright electric signs were unknown. Buildings were then low, streets comparatively narrow, and advertising little understood. Now buildings are higher, streets and pavements wider, and advertising a great art.

With larger signs drab streets would be brighter and there would be more work for sign makers, electricians, metal-workers, painters, and all those who deal with wood, glass, cloth, lamps, and so on.

The objection to larger projecting signs is twofold. In the first place it is contended that large signs in public streets are dangerous. This may have been true in olden days but now that buildings are stronger such a danger does not exist. In any case hotel lamps, which are much heavier than projecting illuminated signs, are allowed to extend for four feet over the pavements of Birminghain, and theatre and picture palace canopies may cover the whole of the pavement and have painted signs hanging down. Shop window blinds, often with the iron supports dangerously low, also cover the pavements, and there seems no reason why a sign should be any more dangerous than these.

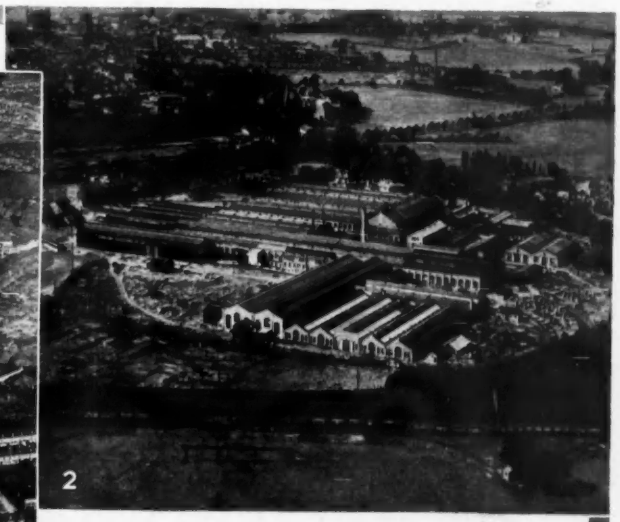
The second objection is that a miscellaneous collection of signs of over 12 in. in length would spoil the artistic appearance of city streets. In Birmingham, there are no artistic streets in the centre of the town nor in the shopping centres of the suburbs. In fact, Birmingham streets are noted for their gloom, and a few larger illuminated signs would do much to add to the appearance and provide a little cheerfulness to this industrial city.

In Birmingham the General Hospital has a projecting sign much above the limit, yet when the City Surveyor's attention was drawn to it he replied that exceptions had to be made for hospitals. Quite so, everyone agrees, but if a larger projecting illuminated sign for a hospital does not offend the æsthetic tastes of the City Surveyor, and is not a menace to the safety of the public, why should not commercial signs be allowed to exceed the 12-in. limit?

So far, correspondence in the local Press, publicity in the right quarters, and personal interviews with the City Surveyor have failed to bring any alteration in the 50-year-old by-law. The authorities must give way ultimately and when they do the electric sign trade, in Birmingham at any rate, will improve beyond our wildest dreams.

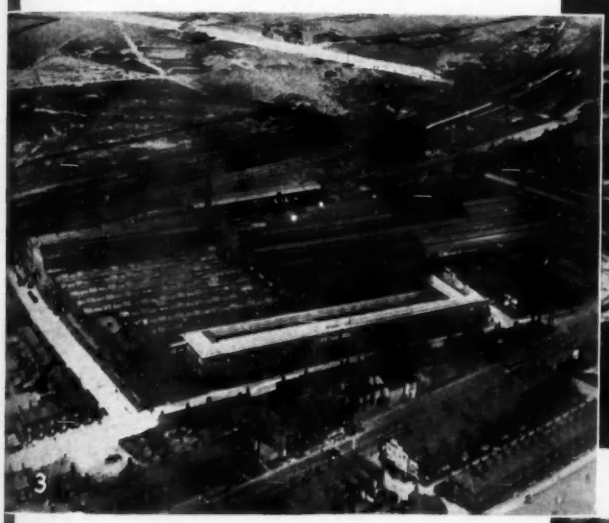
C. H. LEA.

1. The G.E.C., Witton, Birmingham



2. The English Electric Co., Ltd., Stafford

3. Ferranti, Ltd., Hollinwood, Lancs



4. Metropolitan-Vickers, Trafford Park, Manchester

5. Lancashire Dynamo & Crypto, Ltd., Trafford Park

6. The B.T.-H. Co., Rugby

[*Aerofilms, Ltd.*

A few of the leading British electrical manufacturing works

The Trolley Bus. By Henry Watson

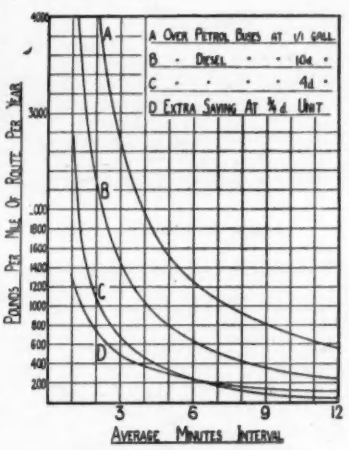
Advantages and limitations compared with those of motor vehicles

THE economic field of the trolley bus is related to the frequency of the service, and falls between that of the tramcar and that of the petrol bus. While the tramcar is still the best form of transport in large cities, the trolley bus possesses many advantages in compact towns, especially where the streets are narrow. Frequent service, many stops, unrestricted routing, and cheap electricity give the conditions under which its merits are displayed to the greatest advantage.

In compiling the table of comparative costs, given below, of operating six-wheel 60-seat buses of different types engaged on heavy urban duty with an average of six stops per mile, the following assumptions have been made:—

Annual mileage per bus, 36,000; interest, 5 per cent. Costs: trolley, £2,100 (life 10 years); petrol, £2,000 (life 7 years); Diesel, £2,300 (life 7 years). 5 per cent. sinking fund; 10 years=8 per cent.; 7 years=12.3 per cent. Average service interval, 6 minutes over 16-hour day. Electricity is taken at 1d. per kWh, but the largest tramway systems pay only 0.75d. to 0.85d. per kWh.

As the average consumption of British trolley buses is 1.6 kWh per mile, and the average all-in repair cost is 2¼d. per mile, the conditions postulated are more severe than the average.



Trolley bus economies

COMPARATIVE COSTS OF OPERATION.

Vehicle.	Trolley Bus.	Petrol Bus.	Diesel Bus.	Diesel Bus.
Consumption, kWh p.m. or m.p.g.	1.9	4½	7	7
Cost of electricity per kWh or fuel per gal.	1d.	1s. 1d.	4d.	10d.
EXPENSES.		Pence per mile.		
Power	1.9	3.2	0.7	1.5
Traffic and general	6.0	6.0	6.0	6.0
Repair and tyre	3.0	4.0	4.0	4.0
Tax	0.6	0.6	0.6	0.6
Repair overhead gear	0.4	—	—	—
Financial, ex. buses	1.9	2.4	2.8	2.8
Financial, overhead	0.3	—	—	—
Financial, garage	0.2	0.2	0.2	0.2
	14.3	16.4	14.3	15.1
Extra for 5 per cent. drop in speed	—	0.5	0.5	0.5
	14.3	16.9	14.8	15.6
Saving, electrical at 1·0d. per kWh	—	2.6	0.5	1.3
Saving, electricity at 0.75d. per kWh	0.5	3.1	1.0	1.8
Tax per mile	0.6	2.0	0.6	1.5
Saving with 6 min. service*	—	£1,260	£240	£630
Saving with 3 min. service†	—	£2,720	£680	£1,460

* At 1d. per kWh. † 0.2d. extra per bus-mile saved with higher frequency; 234,000 bus-miles per year.

The high sustained acceleration of the modern trolley bus, with its ease of control and consistent performance, enables it to give a 5 to 10 per cent. higher average speed, in urban service, notwithstanding its lower maximum speed, as compared with the petrol, gear-driven bus. Thus, if 18 m.p.h. can be attained in, say, 15 seconds instead of 22, a 10 per cent. gain will accrue. Only 5 per cent. is assumed, however.

The Value of the Electrical Load

A town of 150,000 population may require 100 buses for an effective local transport service, which would call for, (1) an annual expenditure per head, on fares, of 30s.; (2) an annual bus mileage of 36,000; and (3) a revenue of 1s. 3d. per mile. 3.6 million miles would be run, and 6.8 million kWh would be used annually. With 90 per cent. of the vehicles in service, the maximum load would be 1,710 kW; allowing 1.9 kWh per mile and 10 m.p.h., the load factor would be 45 per cent. At 1d. per kWh, this load would be worth £28,400 per annum. Allowing 2½ lb. of coal per d.c. kWh, it would make a steady demand for 7,600 tons of coal per annum.

If petrol buses can penetrate an area closed to trolley buses on æsthetic grounds, they may earn a sufficient extra revenue to offset their higher operating cost by giving a through service. The saving estimated above is realised *only* if routes are equally extended as regards local traffic, for trolley buses cannot partake in exceptional traffic (which seldom produces 5 per cent. of the normal revenue) off or beyond equipped routes.

Electric traction affords a saving which increases with the frequency of the service. In a town requiring 100 buses, as much as £25,000 annually can be saved quite easily with six-minute services, as compared with the petrol bus.

On the other hand limitations of *regular* routing may have serious consequences, and towns whose boundaries are hemmed in by adjacent authorities' areas are not likely to be favourable for electric traction.

The Diesel Engine

The development of a successful Diesel-engined bus will undoubtedly appreciably diminish the economic advantages of the trolley bus, but they can never entirely extinguish them. Part—but not all—of the economy of trolley and of Diesel buses (using oil at 4d. per gal.), over the petrol bus, lies in escaping the petrol tax, but any extensive development of Diesel road traction must result in its fuels being taxed. My final estimate allows for 6d. per gal. tax, though the tax yield per bus, per year, is still less than with petrol vehicles, owing to the higher m.p.g. with the Diesel engine.

Special taxation of trolley buses, to bring them into line with petrol vehicles, is unlikely.

Traffic Limitations

The traffic limitations of trolley buses are often greatly exaggerated by advocates of self-propelled vehicles. They will be apparent only in emergencies, or occasionally with very frequent services, as in large towns.

It is not wise to operate a 10 per cent. more costly system, or to provide a 10 per cent. slower service, merely to be able to mitigate the delay due to emergencies, to the extent of a small fraction of 1 per cent. of passengers' travelling time over the year. Traffic delay figures for tramway systems show that breakdowns cause an extremely small percentage loss of time over the year. Further, the trolley bus can offset its awkwardness in emergencies by a more consistent adherence to schedule, and more reliable individual performance, though the benefit of this is not so spectacular as with facilities for use on exceptional occasions. An auxiliary petrol bus fleet will afford flexibility in emergencies.

Trolley buses do not permit of mutual overtaking, but this is a limitation of negligible value in most towns, because services are not sufficiently frequent over a sufficient length of route. It will rarely become noticeable until ½-minute intervals are reached.

Overhead Construction

Trolley bus systems are best without complicated crossings and junctions, as turnouts at crossings introduce many insulators and dead points. Yet no especial difficulties need be anticipated, if the overhead gear is properly designed, and the insulators are placed in the correct wires. Trolley buses have the same characteristics as *conduit* tramcars at crossings, and such stops as occur need not be serious.

Even if overhead wires are objected to on account of their appearance, the trolley bus offers valuable compensating æsthetic advantages, in quieter running and absence of fumes.

The value of using existing tramway overhead gear is often overrated, especially when much reconstruction is required for trolley buses and where the service frequency is high, but it gives the advantage of having overcome prejudice against wires, whereas a proposal to institute a new route immediately creates hostility. The benefit in speedy, quiet and comfortable transport, and the financial saving through using trolley buses, on a route formerly having a tramway, with a 3-minute service, is hardly any greater than on a route demanding new equipment throughout.

Tramway Burdens

The Municipal Tramways and Transport Association has prepared a memorandum on the final report of the Royal Commission on Transport. The Association points out that the total average cost per tramcar of the permanent way was £347 (maintenance, £127; interest and sinking fund, £169; local rates, £51), and that this policy is progressively inequitable. At the end of 1930 there were 13,700 tramcars and 2,246,800 other vehicles licensed; the entire cost of building and maintaining a large proportion of 2,420 miles of roads is still borne by these tramcars.

Regarding the alleged obsolescence of tramways, the Association states that eighteen of the largest authorities have recently spent nearly £7,000,000 in extension and improvement of their services, with generally satisfactory financial results.

Long-distance Telephony. By Paul Frick

Recent developments described by an officer of the German Telegraph Service

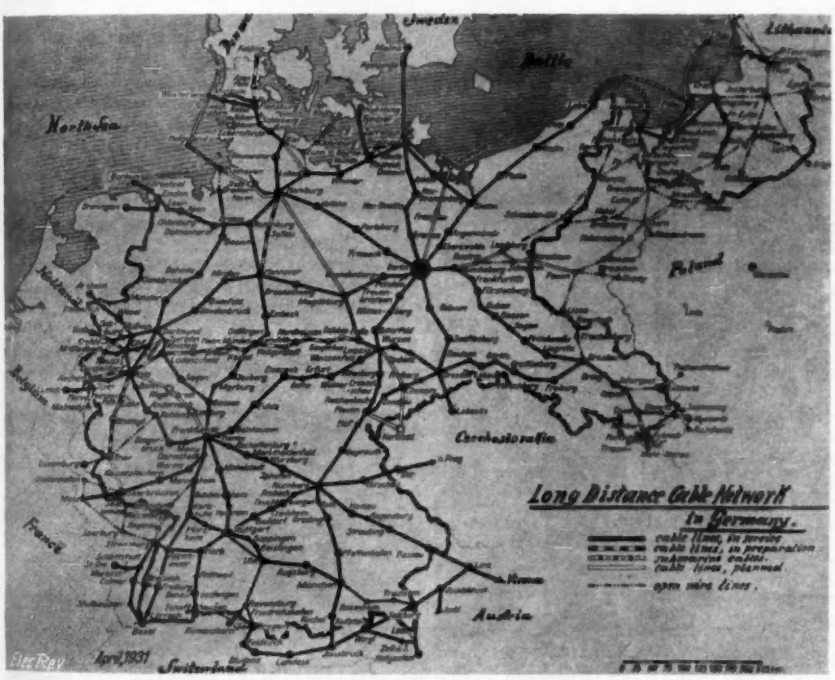
PRIOR to 1921 the German Reichspost, with some exceptions, used bare overhead pole lines for telephony. When the steady growth of the network, frequent widening and changing of highways, and the hazard of sleet and wind storms prompted the installation of underground toll and long-distance circuits, the coil-loaded type of cable was chosen, and one of the first to be laid was designed to cater for the increasing traffic between Berlin and the Rhineland.

That cable was drawn into cement ducts of 100 mm. inside diameter between Berlin and Cologne. The Berlin-Hanover section was completed in the autumn of 1916 and the remainder in 1921. The total length of the channel is about 600 km.; it contains 6,300 manholes with 411 iron casings for loading coils. The weight of the Berlin-Cologne cable is approximately 12,600 tons. The overall length of the circuits is about 117,000 km. The Siemens and Halske Co. manufactured and laid the greater part of the cable.

The Berlin-Hanover section contains 52 double wires of solid copper within its 80 mm. diameter sheath, 24 in the outside layer being 3 mm. and the other 28 being 2 mm. in diameter. The conductors are insulated with paper and air spaced; the core is covered by a seamless compressed lead sheath. The 26 quads include a total of 78 voice-channels.

The coil cores consist of thin iron wires, ring-shaped and wound within a rectangle transverse-section; their fine copper wire coils are protected by insulating ribbon, and surrounded by metallic casings fixed to special framework (zinc boxes within larger iron cases) and finally the hollow space between the two boxes is filled with insulating compound. Modern coils have compressed iron-powder cores.

In the same manner the cable balancing condensers are installed in zinc and iron casings. The inner space is carefully protected against the entrance of moisture and the space between the two boxes is filled with insulating compound.



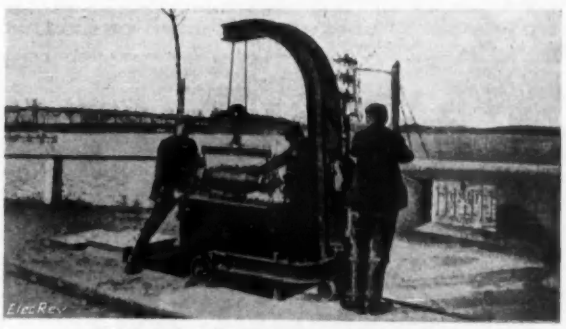
The German long-distance telephone cable system

The Long-distance Cable Company

After the world War the increased importance of toll business decided the Reichspost to provide interurban and international circuits along the main telephone arteries, and the German Long Distance Cable Company (DFKG) was formed in April, 1921, to place the heavily loaded lines underground. The German Reichspost included, there are eight companies associated in this concern.

During the past ten years the DFKG laid out, spliced, and balanced about 10,000 km. of cables. The map shows the development of the German long-distance cable network from 1921 to 1930.

In 1924 and 1925 the lengths of long-distance cables put into service rose considerably over the annual average; nevertheless, during the ensuing years there was still more work done. In order to reduce cross-talk the old cables were equipped with balancing condensers; the steadily growing speaking range required the light pupinisation of a great many circuits, and, finally, about 8,000 km. of cable lines were made suitable for radio broadcasting.



Coil casing being lowered into manhole

The overall length of the cable circuits installed in Germany during the past ten years has been about two million km., and their value amounts to approximately £15,000,000.

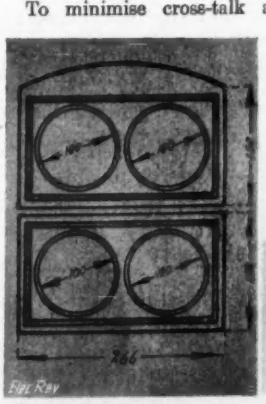
Long-distance Cable Improvements

Great improvement has been made during the past few years in the quality of long-distance cables, particularly the invention of coil-loading, due to Michael Pupin. The German long-distance cables are paper insulated and lead sheathed. By the insertion of self-induction coils the natural speaking range has been considerably increased. For instance, the loaded 3-mm. conductors of the Berlin-Cologne cable (having only a range of 133 km. without coils) permit a conversation to be carried on over more than 600 km. The most remarkable coil-loaded lines are enumerated in the table on p. 188.

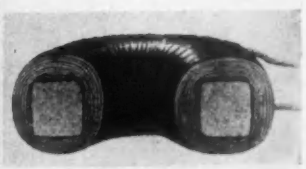
Since the development of the vacuum-tube telephone repeater German long-distance cables have been manufactured with conductors only 0.9 and 1.4 mm. in diameter. Thus, a considerable saving in first cost has been effected. The quantity of copper, for instance, formerly necessary for one conductor of 3 mm. diameter is now sufficient to produce 4.6 conductors of 1.4 mm., or 11.1 conductors of 0.9 mm. diameter of the same length.

To counteract the greater transmission losses of the small conductors repeaters are interpolated every 75 km. for 0.9 mm. and every 150 km. for 1.4 mm. conductors. Thus, within ten years, it has been made possible to increase the speaking range of long cables from 1,000 up to nearly 10,000 km.

To minimise cross-talk and impedance irregularities the method evolved by Siemens and Halske is employed. The differences of the partial capacities are balanced by small condensers in the centre of the loading coil sections, because these sections are short compared with the wavelengths of the speaking currents. The



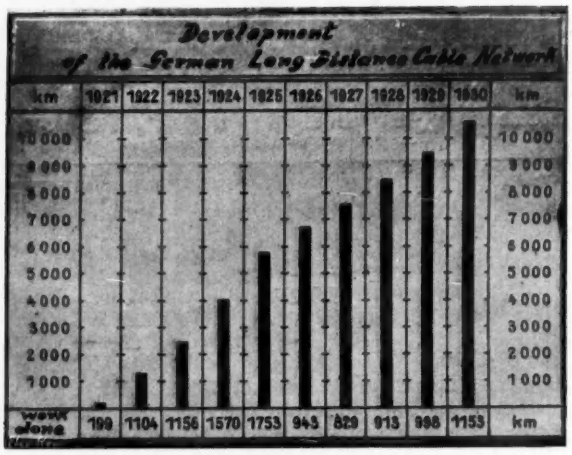
Cement ducts used in the German system (in mm.).



Loading coil for the Berlin-Cologne cable

condensers are enclosed in a lead sleeve and then put into a cast-iron box.

At first the German long-distance network contained cables with 52, 58, 98 and 166 double wires of 1.4 and 0.9 mm. diameter, the pupinisation of which was medium-heavy (combining circuit 200, combined circuit 70 millihenrys), the pupinisation-section being about 2,000 m. in length. Later on, when the limiting frequency became of consequence for speech transmission, light pupinisation with 50 mH for combining and 20 mH for combined circuits was introduced.



Rate of progress

Recently it has been found that for a section of 1,700 m. pupinisation with 140/56 mH for medium-heavy loaded and with 30/12 mH for light-loaded circuits is the most advantageous.

The 1.4 mm. conductors are designed for distances up to 600 km., whilst the 0.9 mm. circuits are arranged for four-wire working to meet all conditions of nation-wide service.

In two of the most important types of German long-distance cables the number of pairs to be quadded is determined by the mutual capacity and the possibility of providing the largest number of circuits within the smallest space. The "A" cable has 98 pairs and the "B" cable 166 pairs, and phantom loadings give them 147 and 249 voice-channels respectively.

The centre of these two standard cable types contains a quad of 0.9 mm. conductors within a lead sheath 1 mm. thick. This central quad, protected in all splices and loading coil-boxes by small lead sleeves, is provided with a "perfect" measuring circuit for the purposes of fault locating.

Cable Circuits for Broadcasting

Recently, in order to meet the steady growth of radio broadcasting, cable circuits required fundamental modification to make them suitable for the transmission of wide frequency bands. For this purpose the central quads of the old cables were fitted with extra-light pupinisation, whilst the latest cables were equipped with two screened pairs and one quad in the centre, and with other special wires for radio broadcasting. Thus four new standard cable types of 64, 78, 130 and 196 pairs were evolved.

The total number of long distance cable types nowadays used in Germany is shown in the table on the opposite page.

The Central European Service

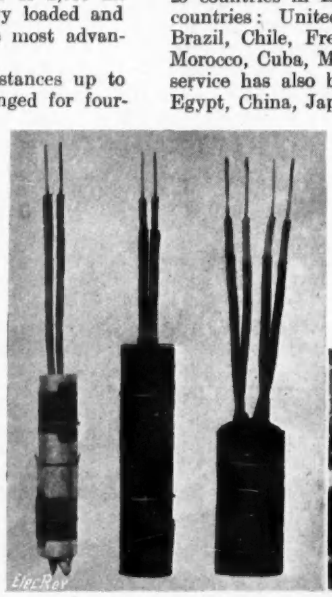
The German Long Distance Company has also taken steps to improve public service with such neighbouring countries as Switzerland, the Netherlands, Austria, France, Czecho-Slovakia, and Belgium.

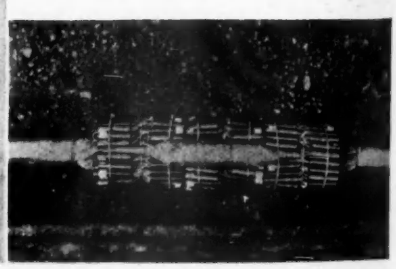
In March, 1926, the German cables were connected to the telephone network of Switzerland, and in May, 1926, to that of Holland. Regular telephone service between Germany and England was established in June, 1926. The long-distance Nürnberg-Vienna cable connected Germany with Austria on January 4th, 1927. In the same year France, Belgium, and Czecho-Slovakia were connected to the German cable system. In 1928 it became necessary to increase the German connections with Switzerland and the Netherlands in order to give quick and efficient service. Recently a new cable between Denmark and Germany was put in hand.

Year.	Line.	Length km.	Dia. of conductor mm.
1905 ..	New York—Philadelphia ..	145	1.29–1.63
1905 ..	New York—Newhaven	133	1.29–1.63 –1.83
1911 ..	(New York)—Philadelphia—Baltimore—Washington.	217	1.29–1.63 1.83–2.59
1914 ..	Boston — New York — Philadelphia—Washington.. ..	730	1.29–1.63 1.83–2.59
1913 ..	Leeds—Hull	95	1.68
1915–16	London—Birmingham—Liverpool	323	2.0 –3.47
1913–14 1921	Berlin—Cologne	600	2.0–3.0 and 0.9–1.4

Notable coil-loaded telephone cables

These extensions of the long-distance cable system made Germany the most important factor in this respect in Central Europe. To-day Germany has opened telephone service with 25 countries in Europe, and with the following overseas countries: United States, Canada, Argentina, Australia, Brazil, Chile, French Indo-China, French Morocco, Spanish Morocco, Cuba, Mexico, Dutch Indies and Uruguay. Regular service has also been planned between Germany and Siam, Egypt, China, Japan and Paraguay.





Balancing condensers, and how they are interpolated

Laying-out and Maintenance

As mentioned before, the Berlin-Cologne cable was drawn into cement ducts; nowadays all German long-distance cables, with the exception of small lengths in the larger cities, are laid directly in the ground.

Maintenance, undoubtedly, has more to do with the quality of service than any other factor. Every year one-third of all cable lines is thoroughly tested for electrical values, and all faults discovered are removed. In 1930, for instance, there were only 26 troubles within nine months, and three months were without any fault.

The German Long Distance Cable Company may review its past work with satisfaction. The network is well designed and well maintained. The cables are able to carry telephone conversations together with telegraph messages and radio programme "hook-ups," and meet all requirements of a unified nation-wide service. The company's success has caused other countries in Europe to create analogous industrial organisations with public administration, the results of which have exceeded expectations.

Manufacture of loading coils

The Sydney Harbour Bridge

The Institution of Engineers, Australia, has sent a cordial invitation to any members of the Institution of Electrical Engineers who may be visiting Australia at the time of the opening of the Sydney Harbour Bridge in March to send their names and addresses to the Secretary of the former Institution, in order that they may be given an opportunity of taking part in the celebrations which will be organised by that Institution upon the occasion. Communications should be addressed to the Secretary, Institution of Engineers, Australia, Science House, Gloucester and Essex Streets, Sydney, N.S.W.

Turbine Oils. By A. B. Owles, A.I.C.

Tests for deciding their suitability

TURBINE oils are mostly obtained from Pennsylvanian crude petroleum, but in the last few years there has been a definite trend to widen the sources of supply, mainly as a result of intensive methods of research into the problem of purification. Crude petroleums are mixtures of substances of highly complex chemical composition, and for this reason some of the crudes do not yield oils suitable for turbine lubrication. Recent literature suggests the possibility in the future of synthetic turbine oil, which should have a more definite composition than the natural product.

Pennsylvanian petroleum is a "paraffin-base crude," whilst others are classified as "asphaltic-base crudes." The oils obtained from the latter contain a much larger proportion of asphaltic hydrocarbons, which do not readily separate from water, although oils from certain paraffin-base crudes are much superior in this respect.

[*Elliott & Fry*

Mr. A. B. Owles is Chief Chemist to the Manchester Corporation Electricity Department, Barton

Lubricating oils are generally obtained from petroleum by a two-stage process; the first removes the lighter fractions (petrol, kerosene, &c.), and the second—distillation under a high vacuum—allows the oil to flow by gravity through a series of stills each fitted with a condenser. Frequently some superheated steam is bubbled through the oil in order to reduce farther the vapour pressure for minimising decomposition. Each still operates under specific temperature limits to yield a number of relatively impure grades of lubricating oils of gradually increasing viscosity and boiling point. Certain of these grades after refining can be blended to give a range of turbine oils.

Refining Processes

Refining is by chemical or physical means, according to the nature of the impurities present. It is usual first to chill the oil below zero Fahrenheit and then to centrifuge it to remove wax. Following this, the oil is sometimes washed with soda and finally heated with certain types of earth, such as Kieselguhr, Fuller's earth, &c., and then filtered. It may be necessary to repeat this treatment two or three times. Earth treatment removes objectionable impurities, mainly of asphaltic origin.

A method of refining of special interest is the so-called "Edeleanu" process by which oils, generally of Russian origin, are subjected to the action of liquid sulphur dioxide at low temperatures. It is claimed that oil so treated resists oxidation more effectively than oil refined by other methods.

In the selection of turbine oils it is usual to compare data obtained from certain chemical and physical tests. There is, however, a need for further investigation to connect chemical data with behaviour in practice. There is also a need for a standard specification to secure uniformity in grading and methods of testing, and I believe one will be available in the near future. Stability of an oil in any particular turbine is best determined by a practical trial covering a period of several months, assuming, of course, that it has previously passed the usual laboratory tests. During the trial run frequent samples should be taken and tested. Turbine builders usually recommend certain viscosity limits for their machines, but the actual selection of the oil is a matter for the user.

Standard Tests

The tests usually applied to samples of turbine oil are as follows:—

(1) *Specific Gravity.*—A knowledge of this property is only useful from the standpoint of the weight-volume relationship, and as giving some indication of the source of the oil. Pennsylvanian oils have a gravity of about 0.89.

(2) *Flash Point.*—This is the temperature at which the vapour from the oil will ignite in a closed vessel of definite dimensions and design. The Pensky-Martens apparatus is that usually accepted for this country, and the "closed" test figure is generally stipulated for turbine oils. It gives an indication of the care taken during refining and should be comparatively high, between about 350 and 390 deg. F., depending upon the grade. Further, high flash point oils generally have less tendency to vapourise during use.

(3) *Viscosity.*—This property affords valuable information regarding the suitability of the oil, and its determination is the most important physical test. In this country the Boverton Redwood viscometer is taken as the standard instrument; this measures essentially the rate of flow of the oil from an agate orifice of standard dimensions, under fixed conditions of head and specified temperature. Viscosities are usually expressed for convenience in Redwood seconds, i.e., the time taken for 50 cu. cm. to flow through the orifice at the temperature under consideration.

Floating the Shaft

Turbine lubrication is essentially one of fluid friction, and the viscosity of the oil should therefore be as low as is compatible with safety, i.e., the fluid film of oil should be maintained intact between the bearing and journal surfaces, particularly during starting and stopping periods. The effect of rotating a shaft at high speed in a well-lubricated bearing is to build up a positive pressure of oil (quite apart from that normally produced by the oil pump) which floats the shaft and keeps the frictionally opposed surfaces apart.

This explains why it is possible to use a relatively thin oil for large units, since in essence the pressure created increases the effective viscosity of the oil. Hence, it is usual in turbines, particularly those of large size, to incorporate auxiliary pumps for maintaining an effective oil pressure at speeds below normal.

Type.	A		B		C	D		E		F		G		H		
	Pairs and (phantom circuits) of . . . mm. in diameter.															
	1.4	0.9	1.4	0.9	1.4	0.9	1.4	0.9*	1.4	0.9	1.4	0.9	1.4	0.9	1.4	0.9
Core	—	2	—	2	—	2	—	2	4	—	4	—	4	—	4	—
	—	(1)	—	(1)	—	(1)	—	(1)	(1)	—	(1)	—	(1)	—	(1)	—
First layer	14	—	14	—	14	—	14	—	24	—	24	—	24	—	24	—
	(7)	—	(7)	—	(7)	—	(7)	—	(12)	—	(12)	—	(12)	—	(12)	—
Second layer	26	—	26	—	—	36	10	32	36	—	36	—	—	50	36	—
	(13)	—	(13)	—	—	(18)	(5)	(16)	(18)	—	(18)	—	—	(25)	(18)	—
Third layer	—	56	—	56	—	—	—	—	—	66	48	—	—	—	—	—
	—	(28)	—	(28)	—	—	—	—	—	(33)	(24)	—	—	—	—	—
Fourth layer	—	—	—	68	—	—	—	—	—	—	—	84	—	—	—	—
	—	—	—	(34)	—	—	—	—	—	—	—	(42)	—	—	—	—
Total	40	58	40	126	14	38	24	34	64	66	112	84	28	50	64	—
	(20)	(29)	(20)	(63)	(7)	(19)	(12)	(17)	(31)	(33)	(55)	(42)	(13)	(25)	(31)	—
Pairs	98		166		52	58		130		196		78		64		
Phantom circuits	49		83		26	29		64		97		38		31		

Types of long-distance telephone cables used in Germany (*See pages* 187 *&* 188)

(4) *Demulsibility.*—This useful test, carried out under standard conditions, determines the speed at which the oil separates from the condensed steam after rapid agitation. The type of apparatus mainly employed in this country is that recommended by the Institution of Petroleum Technologists, and in skilled hands it can yield quite consistent results. The test is fully described in *Standard Methods of Testing Petroleum and its Products* obtainable from the Institution (price 7s. 6d.). It is general to carry out duplicate tests, the average of which gives the demulsification number, which represents the time in minutes required for 20 cu. cm. of oil to separate from the condensed steam.

With new turbine oils a figure of about 2 is normal, but after a short time in service, it reaches from 4 to 6. Frequently, if conditions are unfavourable, the demulsification value may rise to 10, which is not altogether unsatisfactory, but if the figure rises to 20 or more, then the oil will give trouble due to the formation of objectionable emulsions which tend to choke up the oil-ways and even interfere with the governor gear. A persistent rise in the demulsification value should be investigated without delay.

The Formation of Sludge

(5) *Resistance to Oxidation.*—Dr. Michie's test for transformer oils furnishes comparative data as to the behaviour of the oil under intensive conditions of oxidation. Purified air is passed through 100 cu. cm. of the heated oil at 302 deg. F. for forty-five consecutive hours at a given rate in the presence of chemically pure copper foil of known surface area. After the test the oil is cooled, diluted with petroleum ether, and the sludge filtered off and weighed.

Turbine oils usually give results below one per cent., although higher figures are not uncommon. Sludge is of an asphaltic nature and is always found in the emulsions which frequently collect at the bottom of turbine oil tanks. By extreme care in the selection of the original crude, and in the refining of the mineral oil, the tendency to oxidise and throw down sludge is very much reduced.

(6) *Organic Acidity.*—Turbine oils invariably develop organic acidity during use, and the chemist has therefore to keep a careful record of the acid content.

New turbine oils should be almost devoid of free acid, but this can rapidly form under suitable conditions. Furthermore, there is a close connection between the development of acid and sludge as both are products of oxidation. Hence, an abnormal increase in the acid content generally indicates future trouble in the oil circuit, but unfortunately there is no definite guide as to the maximum amount of free acid permissible—largely because of the different conditions under which turbines operate. With large modern units equipped with filtration plants the free acid should not rise above 0.25 per cent., particularly if water is present in the oil.

(7) *Other Tests.*—Tests not so frequently applied are: the cold test, which determines the fluidity of the oil at low temperatures and whether it has been sufficiently refined; the volatility or loss test (which should not exceed 0.5 per cent.) by heating the oil at 230 deg. F., for five hours; and the test for sulphur, by combustion in a bomb calorimeter. More attention is now being paid to sulphur in turbine oils in view of the possible formation of sulphur acids by oxidation. Pennsylvanian oils usually contain about 0.25 per cent.

Various Causes of Deterioration

The power station chemist, besides making the usual routine tests on the oil, also should examine the oil-tank coolers and circuits during overhauls. If emulsion or deposit is found it should be analysed to ascertain the cause.

One essential feature of turbine oil, namely good demulsification, is very sensitive to the influence of mineral impurities in the steam, to adventitious matter, and to chemical change in the oil, so that the origin of such factors should be investigated. The combined effect of rapid circulation and aeration at relatively high temperatures, with possible entrainment of water, will have some action on the best of turbine oils.

The bearings of many turbines run continuously at from 160 to 170 deg. F. without trouble, but temperatures approaching 180 deg. tend to bring about excessive oxidation.

The design of turbines varies to a considerable degree, and this, together with exacting running conditions, makes it difficult to estimate the life of the oil, but under the right conditions a suitable oil will last for years without undue loss in its lubricating properties. Minimising the ingress of condensed steam to the oil system may do a great deal to achieve this result.

In some machines the entrance of condensed steam from the gland packings is unavoidable, but the amount entrained in the oil should be kept as low as possible by adequate settling capacity combined with treatment in a by-pass filter or centrifuge. Either treatment removes not only water, but also suspended matter. In my opinion if centrifugal treatment is employed the temperature of the oil should be below that prevailing in the bearings, more so if the oil has been in use for a considerable time. This is because the asphaltic matter or sludge formed by oxidation is partly soluble in hot oil, and if not removed may be deposited in the cooler parts of the oil circuit, besides affecting the demulsification properties.

Water in the Oil

Excessive water in the oil can give trouble by causing corrosion of exposed iron surfaces, and the products of this action then unite with the free organic acid in the oil to form soaps of iron which are emulsifying agents. Another common source of trouble is due to impurities in the steam which enters the oil through the glands.

As boiler waters are invariably alkaline, containing also lime and magnesium compounds, any priming with leakage of steam to the oil can result in the formation of soda, lime, or magnesium soaps, which are strong emulsifying bodies. Whilst an analysis of the emulsion generally reveals the cause of its formation, sometimes a case may arise where it is difficult to detect the origin of the impurity. One instance I have in mind was due to the presence of traces of nitrogenous bodies which the oil had dissolved from lagging dust.

It is not good practice to paint the oil-ways and tanks, as under certain conditions the pigment and dried vehicle of the paint may contaminate the oil. In any case where paint is called for, it should be subjected to the action of hot oil in the presence of moisture for a given time in the laboratory.

Cleanliness and care in the handling of turbine oil should guard the user against trouble; impurities may act catalytically and be responsible for shortening the life of the oil.

Empire Broadcasting

IN an address to the Royal Empire Society on January 25th, Mr. Noel Ashbridge, chief engineer of the B.B.C., explained how Empire broadcasting would be possible by means of short waves in the light of experience gained since the establishment of the Chelmsford station, G5SW, which had been working entirely on experimental lines for several years. That station, however, had not been able to give a satisfactory service over the whole of the territory which should normally be covered, because it had only worked on one wavelength.

Sufficient data had been collected to indicate that there was a genuine desire for a service from Great Britain on the part of overseas listeners generally and, in particular, of those in the Colonies. The question of planning an Empire broadcasting station had been explored along the lines of making use of directional effects, and for this purpose the Empire would be divided into five zones. The technical equipment would be designed to give the best possible reception facilities for each zone, particular stress being laid upon good reception between 6 p.m. and midnight, local times.

At the same time it was hoped to provide facilities for satisfactory reception at other times of the day by the provision of omni-directional aerials. The aerial arrangements would admit of modification in order to allow advantage to be taken of experience as the service developed.

The contract for the Empire station at Daventry had been placed and work had already started, but some months of careful testing would be necessary on completion of the station before it would be possible to settle down to a fixed routine method of working. It would be necessary to gain experience from tests before a definite programme schedule could be completed. The new station should be ready to radiate its initial programmes before the end of this year.

Eleven directional and six non-directional aerials are to be erected, and they will transmit to various sections of the Empire on different wavelengths.

Mr. Ashbridge outlined the proposed zones and wavelengths as follows:—

Zone 1.—Canada, West Indies, Trinidad, and British Guiana: transmissions during certain months on 19 metres, with an alternative of 32 metres. Special directional aerial for 48 metres to serve Canada and Newfoundland only.

Zone 2.—Australia, New Zealand, and possibly also Borneo: only one wavelength, about 25 metres, at present appears suitable for this area.

Zone 3.—India, Burma, and the Malay States: seasonal variation alternating between 17 and 25 metres; a third aerial system is being erected for this zone to operate on 32 metres.

Zone 4.—Egypt, East Africa, South Africa, and places such as Iraq and Palestine: two aerial systems necessary, for 32 metres and 14 metres.

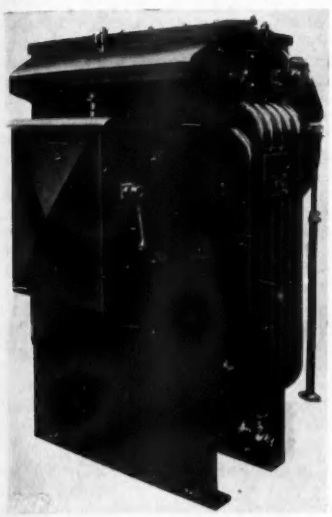
Zone 5.—West Africa, Nigeria, Gold Coast, Ascension, and so on: transmissions to this section require a wavelength of 32 metres.

Varied Engineering Developments

Work in progress at the Met.-Vick. shops

DURING a recent visit to the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., we inspected several products of engineering interest for a wide diversity of applications. Notable among the larger plant under construction are the two 40,000-kVA alternators for the Victoria Falls Power Co.; these are duplicates of the one already in operation, which was the largest 3,000 r.p.m. machine yet built in Great Britain. The welded-steel condensers which are provided with these sets have each a cooling surface of 36,500 sq. ft.

One of the 80,000-kVA turbo-alternators for the new Battersea station is almost completed. Its rotor is of the three-piece link type originated by the company. This set is the largest running at 1,500 r.p.m. yet constructed in this country. Two vertical high-speed water wheels are also being built for abroad with a rating of 7,150 kVA at 600 r.p.m.; several larger sets have recently been completed.



Complete 100-kVA "Transwitch" unit

Motors

A new feature in motor construction is the totally enclosed double air-circuit machine for use in corrosive or dusty atmospheres. Large motors of this type are being built for the Dunston and Barking stations, amongst other places. Synchronous motors are in demand for driving air compressors and for use in cement works; an outstanding order was that for four 600-h.p. 6,300-V motors for the Grimsby Ice Co.

Of very large motors the most striking examples are the two 7,000-h.p. 50-r.p.m. equipments for driving blooming mills, with 1,150 m. centres in Russia. These have a speed range of 0-120 r.p.m., and can develop an emergency torque of 300 metre-tons, equivalent to a peak of 21,000 h.p. They are single armature machines, and, we were informed, are the largest yet built in England.

Work in connection with frequency standardisation is in evidence. This includes motors of varying sizes for industrial concerns in Birmingham and Glasgow, and double-frequency (40 and 50 cycles) rotary converters.

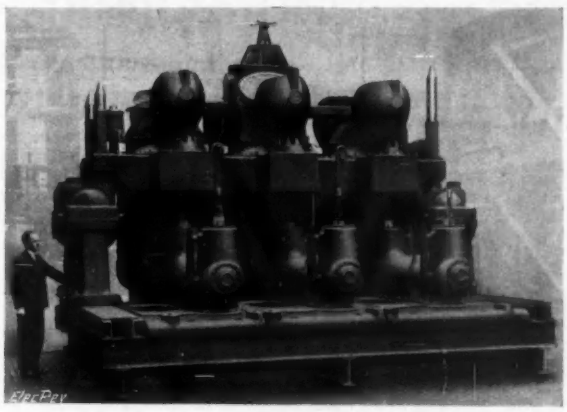
An order being executed for the Lancashire Steel & Iron Co. is for 72 mill motors with an aggregate h.p. of 3,700; these are being fitted with roller bearings.

Control and Protection

New developments in relays have recently come to fruition. Important examples are the high-speed differential relays for parallel feeders which, in conjunction with an impedance relay, are claimed to reduce the time of operation to about one cycle. A large number of relays are being made for secondary lines of the grid, including impedance and lock-in types; the latter are used with G.P.O. telephone lines.

A fixed charge collector meter has been developed to meet the requirements of the domestic two-part tariff, and a four-element meter for use on two three-phase feeders on either three- or four-wire systems.

The highest voltage switches yet manufactured in this country are the 12 three-phase units at 161 kV for export. A number of switches at 132 kV for the grid, and at 110 kV for the Hungarian State Railways are also to be seen.



Metal-clad 1½- million-kVA oil circuit-breaker

Transformers

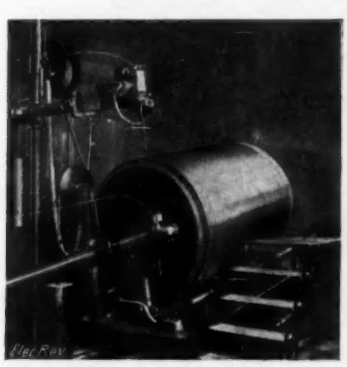
Transformers up to 30,000-kVA capacity, all with on-load tap-changing gear for 15 per cent. voltage range in ten steps, are being built for the grid with air blast cooling beyond 60 per cent. of full-load rating.

The electrified main lines of the Hungarian State Railways call for eight 4,000-kVA 107/16-kV single-phase transformers.

The most interesting developments in distribution are the self-contained portable sub-station, known as the "Transwitch" unit, for rural work, and the non-breathing street-pit transformer. The 18 132-kV potential transformers for the East Anglian scheme are to be installed in connection with the company's "impedance" protective gear; this is said to be the first occasion on which directly connected potential transformers at this voltage have been used for the purpose.

Welding and Traction

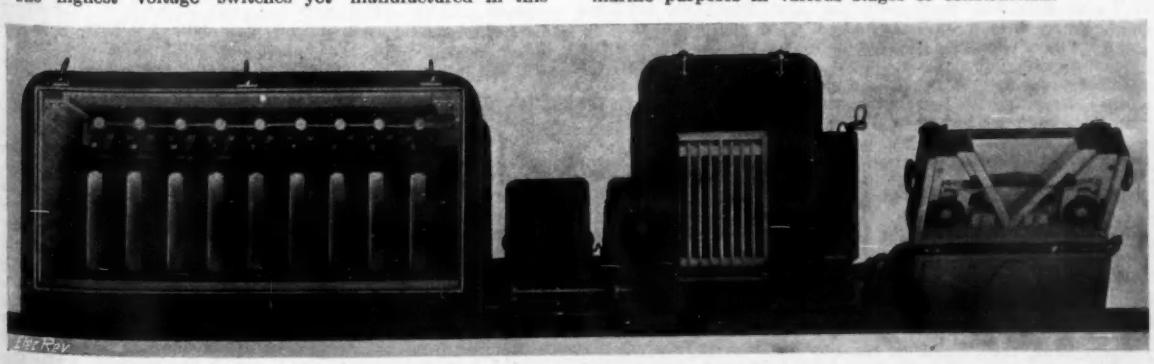
A new form of multiple-operator welding generator has passed its tests successfully. Its field will be in shipyards and other industries where it is impossible to take the machine to the job.



Automatic arc welding machine

Reference has been made above to electrical apparatus under construction for the Hungarian State Railways, and the most important work in the traction department is the 36 electric locomotives for that scheme; four of these are in hand. The system is single-phase at 16 kV and 50 cycles. A new design of d.c. motor with a one-hour rating of 300 h.p. at 575 r.p.m. is being built for traction purposes. By making full use of the ventilation due to the speed of the motor coaches the weight is reduced and the temperature rise is less.

An order is in hand for an exhaust turbo-electric equipment for a vessel being built for the Standard Fruit & Steamship Corporation of New Orleans; it is designed to deliver 1,560 s.h.p. at 90 r.p.m. and to supply a general load of 135 kW. There is also a considerable amount of electrical gear for marine purposes in various stages of construction.



Electro-pneumatic switch group for d.c. railway operation

Plastic Mouldings

An important ally of the electrical industry

WITH the exception of the gramophone trade, which produces at least 30,000 tons of shellac-base moulded records annually, the electrical industry is now the largest user of mouldings, in the form of insulating accessories. But it has had to wait for materials suitable for electrical purposes, probably because the universal appeal of the talking machine and its less exacting requirements diverted the attention of the materials specialists in the early stages.

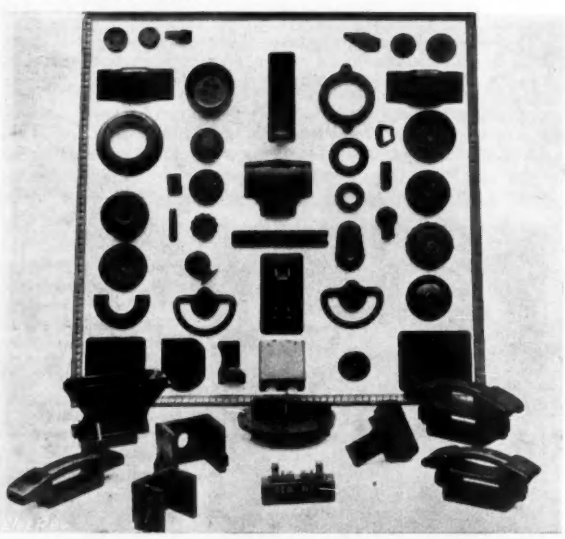
The introduction of plastic composites about 30 years ago was far more revolutionary than was realised at the time. More recently, progress has been rapid and the plastics industry has become perhaps unique in its diversity.

It is not easy to name a trade on which it has not conferred, or one from which it has not derived, some benefit. It is doubtful whether any single person is fully acquainted with all its ramifications, the extensiveness of which is apt to hinder cohesion and consolidation of the young and growing industry.

Excluding the chemist, the engineer is its closest, as well as its most important, ally, and he is likely to benefit from the plastic trade even more in future than he has done in the past. Conversely, he is the backbone of the process; for instance, without the tool maker the amazingly complex and diverse shapes in which plastic mouldings are now made would not be possible.

Design and Practice

The tool stores at the south-east London works of Ebonestos Insulators, Ltd., contain several thousand different moulds with which a great variety of work is done for the Post Office, radio and electrical manufacturers, and the domestic and general engineering trades. Tool production is the key of the trade. The designer of moulds is just as much a pioneer to-day as he was 30 years ago, for it is he who does the real creative work of the industry, and he is responsible for the transition from mind to matter.



Some examples of " Ebonestos " mouldings

Nevertheless it does not necessarily follow that the toolmaker is invariably right and the moulder at fault. Some moulders both design and make their own tools; when they do not, in the interests of both, co-operation between designer and maker must be of the closest.

Unhappily, it cannot be said that the same close contact exists between the moulder and the electrical engineer. Frequently the former has cause to complain that the engineer will not readily discuss his moulding problems in advance. The consequence is that modifications which might have been foreseen had the moulder known more about the intended application are sometimes required after the press-tools and moulds have been made. This makes the job needlessly costly and probably unprofitable.

Of course, the attitude of the electrical engineer is that, to him, mouldings are merely means to an end, whereas to the moulder they are the all-in-all.

The electrical engineer is too apt to be influenced by the technique of familiar materials and processes. When he learns to think, plan, and design in terms of the new medium he will soon realise that conventional constructional forms are not usually best suited to the new materials. Often some quite minor modification of shape or form, which would not alter electrical utility in any significant respect, would lighten the moulder's task very considerably indeed.

The enlightened manufacturer appreciates how much is to be gained by intimate contact and real co-operation, and that while most of his works secrets are probably known to his competitors, his experience remains his own.

Ebonestos is not a synthetic material, but a known mixture having quite definite properties that can be rendered consistent. Under the technical directorship of Mr. Bernard Weaver and the commercial management of Mr. A. Illing, the company moulds for the trade plastic compositions of some seven different grades of materials.

The insulating properties of these are deemed to be good, they are non-hygroscopic, particularly tough, and can be made heat-resisting. Metal inserts can be incorporated at the time of moulding, and thus save a great deal of expense in assembling, while the mouldings are sharp and clean; surprisingly fine screw threads and lettering can be beautifully formed in the press.

The Nature of the Materials

The chemical composition and structure of the numerous products of the moulder's art in use to-day vary considerably. A comprehensive list of ingredients would contain the names of over 150 different substances: the fibrous and powdered fillers; binders of synthetic and natural animal, vegetable, and mineral origins; accelerators for hastening the setting and hardening process; and the metallic salts and oxides used as dyes and colouring pigments are legion.

Ebonite is merely an old trade name for hard rubber. The raw material is mechanically crushed and masticated under the influence of heat, the requisite characteristics being imparted to it by the addition of various substances before it is finally rolled and pressed into the desired shape, and then vulcanised by being subjected to high temperature for some hours.

Resinoid substitutes for ebonite resulted from the production of phenol-formaldehyde condensations with the aid of spirits and acids. By far the most important category is those resins which, by heat treatment, become insoluble and infusible, namely, what is termed the "Bakelite" class of materials. This synthetic substance impregnates and bonds the basic cellulose or wood pulp body, minimises brittleness, lubricates the fibres, and promotes that "flow" which results in smooth moulding.

In the case of "Beatl" and similar ware the raw material fibres are much smaller; the resin, too, in this case of the urea-formaldehyde class, is colourless and of sufficient transparency to permit light to filter through it. The fibres of the pulp are so small that little interlocking can take place, and the moulding becomes translucent, the resin in the pulp acting like wax on paper. Most beautiful colours can be imparted to this material.

Fillers and their Functions

As wood fibre is partially absorbent, it is an ideal filler, and the adhesion between it and the binder is perfect. Paper and cloth are used when toughness is the prime consideration. Long fibres are, unfortunately, visible on the surface, so that, as the finish of the moulding is improved by shortening the fibres, mechanical strength is sacrificed progressively until ultimately the filler becomes granular and the moulding as weak as if pure resin were used.

Fillers are thus more important than their name indicates; the word "body" expresses their function more appropriately, especially as the former term instinctively suggests the dilution of an otherwise perfect compound. Such an inference is, of course, entirely erroneous. The solar system is more than a sun and planets; the system is bonded by the common force of gravity. Where would the one be without the other?

Regrettable, indeed, would it be if indiscriminate use of these materials under unsuitable conditions were to bring them, as a class, into general disfavour. Ebonestos Insulators, Ltd., utilises each of the three broad categories that have been referred to in its most appropriate sphere of application.

Incidentally, on a recent visit to the factory we found it in course of reconstruction. It is not an easy task to rebuild the greater part of a works without interrupting production, especially as the opportunity is being seized to replace some of the older plant with modern machinery. This is an outstanding example of optimistic courage at a time of general retrenchment.

The ideal flexible, arc-resisting, plastic material has yet to be evolved, and synthetic resinoids have only in part bridged the gap between ceramics and thermo-plastic chemicals. But, by judicious selection of the specific types employed and by maintaining rigid control from the early stages of manufacture to the final moulding operation, it is definitely possible to make insulators of unequalled merit and unlimited applications.

The Woodpecker Season Opens

The electricity supply authorities of the Midlands (including the Birmingham Electric Supply Department and the Shropshire, Worcestershire and Staffordshire Power Company) are planning a war against the woodpecker. In recent years these birds have become a pest, and it is estimated that damage amounting to several thousand pounds per annum is done by them to telephone poles and the wooden structures which carry overhead electric lines. Although the electricity authorities have power to carry their wires across country, this right does not carry with it authority to organise shooting parties. The co-operation of farmers is therefore being sought. Even creosoted poles and towers are not immune from the ravages of the birds, and instances can be quoted of these structures having to be replaced within three months of their erection.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

When Will the Grid Become Remunerative?

THE paper which was read by Mr. W. A. Coates before the BELFAST ASSOCIATION OF ENGINEERS on February 3rd approaches the national interlinking transmission grid from the manufacturer's point of view in contrast to other papers on the subject, which have been compiled by officers of the Central Electricity Board or that body's consultants.

In some countries (notably the U.S.A. and Japan) legislation requires a supply authority to have installed plant of such capacity that the largest single generator can be regarded as a spare or stand-by unit. When several power stations operate in parallel as a regular practice, it is permitted to regard the largest generator unit *in the group* as this spare machine. The British grid system is nothing more than a practical subscription to this idea on a national scale.

The many advantages of the grid cannot be realised all at once. The Weir Report did not visualise the scheme as a paying one before 1941, and events since that report was written provide reasons for anticipating the postponement of even that date.

The English problem is different from that of Northern Ireland, where there are only two base-load generating stations at the sides of the area. In Ulster there are few vested interests to contend with, but the general forms of the British and Irish Acts are much the same.

The non-selection of a station does not imply that it will be shut down; its owners may elect to continue operating their own plant, and it will then be incumbent upon the C.E.B. to demonstrate its ability to give a supply in bulk at a lower price before it can compel them to cease generating.

The machinery of the English Act is such that at least 21 months would be occupied in dealing with a case of this sort. Under the Electricity Act (Northern Ireland), 1931, such a position is impossible, since the N.I. Board has full powers to order any plant to cease generation.

LAND ACQUISITION

A somewhat similar difference exists between the 1926 Act of Great Britain and the Northern Ireland 1931 Act in respect of the acquisition of lands. Both Boards, in case of necessity can acquire lands or wayleaves compulsorily, but under the British Act, if a property owner opposes, the C.E.B. has to prove that its technical ends cannot be realised by other means open to less opposition.

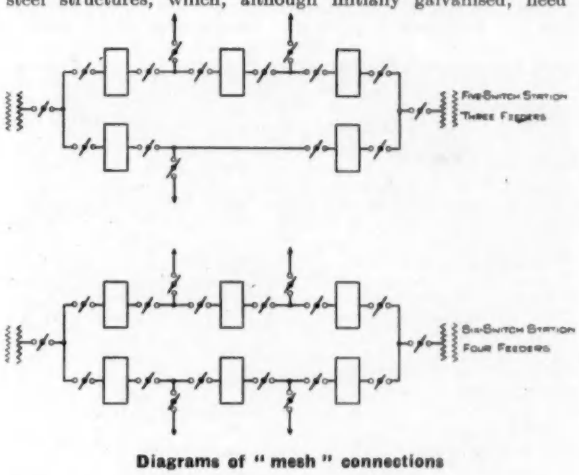
Contracts have been placed to date for:—Overhead steel-cored aluminium lines, 132-kV, 2,586 single- and 410 double-circuit route miles; 66-kV, 23.5 single- and 126.8 double-circuit route miles. Underground cable, 132-kV, 17.2 route miles, and 66-kV, 84.6 route miles. Transformers, 5,875,000 kVA. Oil circuit breakers, 424 for 132 kV, and 85 for 66 kV.

MESH CONNECTIONS

Sub-stations which interconnect rings must control more than two feeders. The first built were of the double-bus type, but recently a "mesh" connection has been developed from the original three-switch idea whereby any number of circuits can be controlled, using always one circuit breaker fewer than would be needed for the corresponding conventional sectionalised bus scheme (see accompanying figure).

It has been accomplished at the expense only of having to trip two breakers whenever it is necessary to interrupt one circuit. There are over 100 simple sub-stations on the grid, and the equipment for one circuit is worth about £6,000; thus the unusual "mesh" connection resulted in an economy well justifying a little extra complication in protective gear.

The "low" type of sub-station, with all the gear on the ground level, has become the standard. Ferro-concrete pedestals need no maintenance; access for cleaning insulator sheds (which accounts for more than half the total maintenance work usually required) is easy and less risky than with high steel structures, which, although initially galvanised, need



Diagrams of "mesh" connections

regular painting; they are only used where space is cramped. The first "low-type mesh-connected" sub-station is now being constructed by the Metropolitan-Vickers Co.

POSSIBLE FUTURE EXTENSIONS

It may be thought that too much emphasis is placed on extensibility, but railway electrification has become at least a possibility since the inception of our national grid. If it ever materialises, it is practically certain that many more sub-stations and miles of 132-kV line will be needed, involving radical regrouping of rings, as at present arranged; it hardly ever happens that a switching system remains as originally planned for more than a decade.

The paper discusses switchgear, transformers, protection, metering, and control in some detail.

Mechanical Problems in Electric Locomotives

THE work of the mechanical engineer in applying electricity to traction has not figured at all prominently in discussions which have followed comprehensive considerations of the general problem of railway electrification.

The object of a paper which Mr. J. D. Twinberrow read at the INSTITUTION OF MECHANICAL ENGINEERS on January 29th was to discuss certain details of mechanism which appear to be desirable for the satisfactory operation of some types of electric locomotives.

In opening the discussion on the paper, Mr. F. Lydall said it had taken some years for it to be appreciated that one could not take the ordinary conditions of steam locomotive working and apply electric locomotives to them. Speeds were very much higher and tractive efforts had also been very much increased with the use of electric locomotives.

As an example of the duty called for from them he mentioned that in the United States a single electric locomotive was now required to haul a passenger train weighing 1,000 tons at a speed of over 90 miles an hour on the level. This particular locomotive had electrical equipment of 3,750 h.p. Thus the problems incidental to the mechanical design of an electric locomotive were far more severe than with a steam locomotive, and were very much more difficult to solve than the problems of electrical equipment.

EXPERIENCE ABROAD

Why had the gearless locomotive not worked satisfactorily on the Paris-Orleans railway while it was able to give the service in America to which he had just referred under much worse conditions than those imposed in France? In the same way, troubles with the quill spring suspension of the motors had been overcome on those same electric locomotives in America. Mention had been made in the paper of the fact that the wear on tyres was reduced by 50 per cent. if articulated bogies were employed; he would like to be informed on what experience that statement had been put forward.

Mr. F. Jackson referred to the electric locomotives built for the G.I.P. Railway in India, and said that, although it was only after long consideration that the Metropolitan-Vickers design was adopted, there had been no reason to regret the decision. The Winterthur drive used, although it appeared complicated, was quite simple and worked well. The drive was contained in a case which was water- and oil-tight and was lubricated after the manner of a motor-car gear box. Examination of the gear after a considerable period of service showed no appreciable wear.

He believed the nose-suspended motor would have a long life yet, if only from the advantage that there was a greater tractive effort from an engine with coupled wheels; he could not agree with the author that this type would have to be eliminated from all future electric traction schemes for other than low speeds. The great drawback of the gearless locomotive was that the motor speed was necessarily low and the motor had to be large and expensive.

Herr A. M. C. Hug mentioned that on the Swiss Federal Railways the use of articulated trucks had shown much less wear on the tyres in tests with articulated and non-articulated trucks under precisely the same conditions.

Although the nose-and-axle suspended motor was a very simple and cheap method for individual axle drive for moderate speeds, for higher speeds, or if there were more than two driving axles on one bogie, the nose-and-axle suspended type of motor was not be recommended. It was then better to have an elastic suspension of the motor, and the tendency was in this direction.

SIMPLICITY NEEDED

Mr. W. A. Lelane asked whether the electric locomotive had been the success that had been hoped for it. The main point to be aimed at was simplicity; could it be suggested that the

electric locomotive was simple? The strength of frames should be thoroughly investigated, because trouble was being experienced overseas through the breakage of frames, which seemed to be due to the slackening of the bolts.

Mr. G. H. Fletcher said the nose-and-axle hung type of motor did not deserve the condemnation which the author had given to it. On the South African railways there were 400 such locomotives, which had run an aggregate of 140 million miles, and up to date not a single failure had been reported. Although there was serious deterioration of the track at the points of acceleration and retardation, there was no such deterioration in the centre of a measured mile over which tests were carried out.

Mr. E. H. Croft thought that an outside frame for electric locomotives was better than an inside one. There was also a good deal of evidence to suggest that articulation was wrong. The method of mounting the motor on the truck could affect the adhesion during acceleration and several ideas had been tried whereby the field strength of the motors was varied with a view to making the actual effort of each pair of wheels equal to the adhesion that was available. Did the author suggest that the side-rod drive was more or less dead? Personally he would have thought that for low speed the ordinary axle-hung motor was the right thing, and that for high speed some form of quill drive was absolutely necessary.

The President (Lieut.-Col. Kitson Clark) asked if in the use of any spring drive there was danger of resonance. In a certain case recently there had been a fear of this; there were some drives with volute springs, for instance, which looked as though they might be dangerous.

REASONS FOR RESONANCE

The author, who promised a detailed reply in writing, said that on the G.I.P. Railway there was trouble due to resonance in the case of the express engines. In that case there was no spring in the drive, but the spur wheel was mounted on a spring rim and his impression was that, although this method might be desirable for a.c., its use was questionable with d.c. because it undoubtedly had an influence on the amplitude of the angular oscillations.

He maintained his antipathy to nose-and-axle mounted motors, because by abandoning that system it was possible to make the wheels of ordinary carbon steel and there were none of the difficulties associated with the use of high-tensile highly tempered steel for this purpose, together with the heavier initial expense and maintenance.

This type of suspension also introduced the liability of hot bearings, flash-overs at the motors, and so on. Indeed, he was inclined to withdraw the qualified approval he had given to this system in the paper so far as low-speed working was concerned.

Anomalous Propagation

ONE of the fundamental problems of electromagnetic radiation is that of the spreading of waves from a Hertzian dipole which is assumed to have a length very small compared with (*a*) the length of the waves, and (*b*) the distances at which the waves are observed. Theoretical investigations show that for a sinusoidal oscillating dipole and for distances from the dipole less than about one wavelength, the amplitude and phase of the wave vary with distance in a manner which is not so simple as their variation at distances greater than this. This has often been referred to as the "anomalous propagation" near a dipole source.

Several attempts have been made, by the use of wireless waves, to verify these theoretical deductions, but they are not entirely satisfactory. Three independent groups of experimenters have obtained results which do not agree with theory; none of them attempted to check the theory inside a distance of 0.16 λ, where the results are most interesting.

EXPERIMENTAL ERRORS AVOIDED

In the paper which they read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS on February 3rd Messrs. J. A. Ratcliffe, L. G. Vedy, and A. F. Wilkins suggested various possible errors in the previous experiments and they described an investigation which they have conducted in which, it is believed, the errors referred to have been avoided. The special feature of the authors' work is that long waves (1,000 m.) were used so that investigations at several points which are only a fraction of a wavelength from the transmitter could be carried out.

In particular, by using this method observations have been made within the distance of 0.16 λ, up to which distance the results obtained agree with theory. The field re-radiated from a receiving aerial has been investigated, using long waves, and it has been found to be in accordance with the ordinary theory.

MAGNITUDE OF THE AERIAL FIELD

In the past there has been considerable doubt about the actual magnitude of the field radiated from an aerial of height h with a large-capacitance roof and with its lower end connected to earth. Some writers have assumed that the aerial behaves like a wire of length h in free space, whereas most workers have assumed that it behaves like a wire of length $2h$ in free space, the image in the ground contributing an effect equal to the direct effect of the aerial. Experiments are described which give a definite answer to the problem, the authors having proved that the field due to an aerial with its lower end connected to earth is, at a near-by point on the earth's surface, equal to twice the field which the aerial alone would give in free space. The theoretical significance of this fact is discussed.

If previous suggestions are compared with the experimental results the only one which will fit the latter is that, if the earth is assumed to be a perfect conductor, the reflected wave will have the same amplitude as the incident wave and will be in phase with it, so that the total field must be twice that which would be produced by an aerial situated in free space.

In particular it now appears to be incorrect to imagine the waves to be incident tangentially on the ground and to be reflected with the Fresnel reflection coefficient, and it is also incorrect to imagine them incident at the Brewster angle with a zero reflection coefficient. There does not at present appear to be any theory which shows clearly why the factor β should be equal in magnitude to 2.

The work described in this paper was carried out as part of the wireless research of the Cavendish Laboratory, Cambridge.

Economies of High-voltage Railway Electrification

SOME of the problems which are encountered when supplying electricity for d.c. traction purposes are outlined in the paper which Mr. C. S. Whiteley read before the Students' Section of the North-Western Centre of the Institution of Electrical Engineers at Manchester on February 2nd.

In 1929 rather more than 5,000 route miles of the world's railways were electrified, over 50 per cent. of which was operated on the d.c. system, which will be used in this country. When power is purchased, its delivery should be arranged at as few points as possible in order to maintain the load factor as high as possible. On the Chicago, Milwaukee, and St. Paul railway in the U.S.A., the daily load factor at one sub-station was 20 per cent., in one division 50 per cent., and at three feeding points of the same company almost 90 per cent.

Since by doubling the pressure on the line it is possible to reduce either the cross-sectional area of the contact wires, or the number of sub-stations to the fourth part, the highest practicable contact line voltage would be the most economical. Moreover, the increase in cost of converting plant is not directly proportional to the increase in voltage, especially in the case of mercury-arc rectifiers.

From the supply engineer's point of view there can be no doubt that the economies resulting from the use of higher pressures are real. Other factors, however, have to be considered, particularly vehicle equipment and contact system, on both of which maintenance charges increase rapidly with increase of voltage. 1,500 V now appears to have become a recognised standard for suburban work, except where it is necessary to line up with existing systems at lower voltages. Whilst the author is inclined to favour the adoption of somewhat higher pressures than this for main-line electrification, it is, nevertheless, significant that for no project so far considered for this country has it been found expedient to exceed 1,500 V.

SPACING OF SUB-STATIONS

For the determination of the capacity of converting plant and the most advantageous distribution of sub-stations, local conditions prevent hard and fast rules being laid down. Much depends on the traffic schedule; with an infrequent service the better load factor resulting from greater spacing of sub-stations may justify the additional expense of feeder copper required to counteract the increased voltage drop.

CONVERTING PLANT

The rotary convertor is the best known and most widely used form of plant for a.c.-d.c. conversion, but the mercury-arc rectifier has, at last, come into its own, and it appears to have a very hopeful future before it. It can now be said to have approached to within very close limits of the reliability of rotating convertors, whilst from the point of view of efficiency, particularly at high voltages and under fluctuating load conditions, it has no equal. The mercury jet-wave rectifier has been employed in traction sub-stations, and the author ventures to predict that this device will become a standard piece of apparatus having a considerable sphere of utility.

The switchgear for the d.c. side of a traction sub-station is of a type peculiar to itself. The main item is a contactor pattern air-break circuit breaker, which may be of the high-speed type, to limit the duration and magnitude of short-circuit current to a value below the flash-over or arc-back point. To accomplish this the breaker must partially open its contacts in response to a tripping impulse, and establish an arc of sufficient length and resistance to check the short-circuit current before it reaches its final steady value. Then as the contacts continue to open the current is reduced and interrupted by the extension and rupture of the arc. Oscillograms obtained during short-circuit tests on a 2,000-kW, 800-V, 25-cycle rotary convertor show that the current peak reached with the high-speed circuit breaker in circuit is only some

65 per cent. of that which occurs with an ordinary breaker. Also, the rate of fall of current decreases rapidly immediately before the arc is extinguished by the high-speed breaker. This prevents abnormal rise of voltage, indeed it is not more than some 15 per cent. above normal.

AUTOMATIC CONTROL

New sub-stations are to-day almost invariably controlled to a greater or less degree automatically, whether they be attended or unattended. In many cases fully automatic operation, dispensing with operating staff, can be justified economically by the saving effected due to elimination of the wage bill. A more vital criterion, however, namely, service reliability to the highest possible degree, calls for automatic control. The paramount importance of continuity of supply cannot be over-stressed, and with automatic operation the rapidity with which service can be restored following an interruption of supply is often a deciding factor in its favour.

Tower Erection Methods

THE procedure followed in the construction of overhead transmission lines is explained in the paper which Mr. A. M. E. Maylett read before the London branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on January 29th.

Although geological maps enable one in a general way to form an idea of the subsoil conditions, experience proves that for exact data of local formations trial borings are essential. It is safe to say, of this country at least, that one of the most difficult stages is in obtaining rights of way and wayleaves.

FOUNDATIONS

Foundations are the keynote of all construction work, and on the accuracy and speed of setting depend the later phases of work. Whether manual labour or mechanical plant is used for excavating, it is advisable to cut a hole with the smallest practical working clearance to the foundation. Suitable mechanical excavators are costly and it is seldom found, after taking into consideration all factors, that they make any saving over the pick and shovel method.

The Malone anchor is a type of concrete foundation having a long column of small diameter at the underground end of which is formed a bulb nearly spherical in shape. The process of preparation is simple. A hole about six inches in diameter is drilled at the same slope as the legs of the tower to a depth of from eight to twelve feet or so. Into this hole several sticks of dynamite are lowered and a long length of insulated wire is run to a battery or exploder. Some earth is dropped on the dynamite and lightly, but firmly, tamped and the charge is then exploded.

After the shot the hole is cleaned out and the bulb calipered to test whether the desired diameter has been obtained. If the cavity is not large enough a second charge is prepared in the same way, excepting that water is poured into the void to get full value from the explosion. In suitable ground, such as well compacted earth and clay, the cavity resulting from a known charge can be fairly accurately gauged and regularly repeated.

STEEL TOWERS

The steel sections from which towers are built up are received from the mills in approximately correct lengths, and they are then passed into the fabricating shops for bending, cropping, punching, &c. The bays in which the fabricating of the parts is done are so arranged that the sections pass through the various operations in progressive order without retracing.

Nearly all work is done to steel template on a mass production scale. The punched and sheared sections are thoroughly inspected and checked at all stages of production, and are finally passed to the pickling and galvanising baths, after which they are once more examined before going forward to the erection crews on the job.

At the present time tower material is usually sent out "piece-small," that is, in unit parts, of which there may be upwards of two hundred per tower. When shipped abroad the pieces are sometimes bundled for convenience of handling and shipping. The pieces vary from two to thirty feet or so in length, and each piece is legibly marked with a reference letter or number for easy identification at all stages of the work. Field material schedules are prepared listing the number of each part and the bolts required for each type of tower.

METHOD OF ERECTION

Several methods of erection have been tried but the "unit method," that is, building the tower piece by piece from the foundation upwards, is favoured because the plant required is the minimum and is easily transported from tower to tower.

From 12 to 16 men comprise a gang, according to the weight of parts to be lifted into place. Of these, four men are sent ahead in advance of the building crew to sort out the component parts; they also loose-bolt the bracings in the centre, and frame the crossarms and peak in readiness for the crew. Four topmen are usually engaged on the tower in fitting the sections together, and the remaining four or eight groundmen haul up the parts to the topmen.

A "gin" pole, some tower hooks, a few handlines, and the usual blocks and falls, are all the plant needed. Spanners and bolts are carried in a large pocket in a leather apron worn by the topmen. One man to each corner is the usual disposition aloft, corner legs first and then bracings being hoisted to them as rapidly as they can be fitted together. The "gin" pole is raised as each panel length is added. When the erectors become accustomed to the many parts they rarely find it necessary to refer to the erection diagrams issued to them.

Moulding presses at the Ebonestos works (*See page 192*)

Electric Water Heating Progress

ON January 27th a conference was held at the London Lighting Service Bureau to discuss the development of the water heating load. It was organised at the suggestion of the E.D.A. Domestic Electric Water Heating and Domestic Appliances Committee, and was attended by over 90 chief engineers and water heating specialists from supply undertakings in the London and Home Counties area.

Mr. A. C. Cramb, Director of E.D.A., introduced the subject and gave an account of the development of the water heating load at Croydon since 1925, which had resulted in 1,882 water heaters being connected, consuming upwards of 3,500,000 kWh per annum.

AT WIMBLEDON AND EASTBOURNE

Mr. A. E. McKenzie, chairman of the said committee, stated that the committee's report (E.D.A. 867) showed how supply undertakings could develop the domestic water heating load, and gave much useful information about the practical application of water heaters. He also dealt with his experience of the water heating load at Wimbledon, 1,739 heaters having been installed, a small proportion being on a special night tariff.

Mr. J. K. Brydges, after speaking of the progress made with domestic water heaters at Eastbourne, emphasised the desirability of the uniformity which the committee's recommendations with regard to the design and construction of electric water heaters (E.D.A. 934) were intended to bring about. He also gave some interesting details of maintenance costs, and showed that this should not exceed 2s. 6d. per heater per annum, even in hard water districts.

Mr. E. E. Hoadley reviewed the development of the water heating business in Maidstone, and said he was convinced that in the very near future considerable business would be done in a great many centres all over the British Isles.

IN BLOCKS OF FLATS

Mr. F. Selley mentioned the success which had been achieved in supplying large blocks of flats with constant hot water heated by electricity, and established the fact that over three gallons of hot water could be obtained per unit in practice. He said that careful records of costs over six years had shown that flats could be supplied with hot water at an average cost of 10d. per day.

Mr. P. C. Honey gave a detailed description of the work of a water heating specialist, outlined many important points to be borne in mind when dealing with prospective users.

In addition to the above contributions by members of the committee, many other supply engineers spoke, including Messrs. H. Wilson, A. J. Waring, C. S. Davidson, W. A. Ritchie, A. C. Green, J. Lesser, J. Cleary, J. Savage, and E. K. Richardson.

From their remarks, and those of the previous speakers, it was evident that considerable progress is being made with the development of the water heating load, especially where the domestic tariffs offered include a unit charge of ½d. or less. Trouble from the deposit of scale by hard water appeared to be very largely overcome by reducing thermostat settings to 170 deg. F.

The conference finally passed a resolution to the effect that the use of electricity for water heating constitutes a large potential load which will be of great value to all supply undertakings, and that to ensure a rapid development of this class of business it is essential that supply undertakings should arrange for hire and hire-purchase facilities and the appointment of water heating specialists to their staffs.

Flux-covered Welding Electrodes

Impressions of a laboratory visit

IT might reasonably be supposed that electrical engineers have a better knowledge of the technique governing the quality and economy of constructional work by arc welding than members of other branches of engineering, but this is not the case, probably because electrical men naturally tend to study the art more from the electrical than from the metallurgical point of view.

True, the welding industry must be grateful to its electrical colleagues for ingenious designs and inventions and the construction of arc-welding machines of high electrical efficiency, but unfortunately these are not the factors of primary importance in connection with welding proper. It must be remembered that electrical energy supplied to the arc does not materially affect the chemical composition of the metal deposited.

Great Britain has been for many years the home of the flux-covered electrode, and no doubt this has a bearing on the fact that better-quality arc welding is carried out in this country than elsewhere. The tendency to use covered electrodes is now becoming more general in the United States.

Covered Electrodes

A few of the primary features of welds made with covered electrodes are: less current required to obtain satisfactory penetration; less disturbance of the crystal structure of the metal adjacent to the weld; freedom from oxide and other harmful inclusions; greater resistance to fatigue and vibratory stresses; greater resistance to corrosion; greater ductility and tensile strength; and less distortion of the work due to heat stresses.

It is believed by some engineers that the use of bare electrodes for work on vessels and structures not subjected to high stresses is economical, and although this is probably true for certain conditions it is not a safe policy to adopt for those inexperienced in arc welding.

It is important to remember that the electrode cost often represents only a small item in the total cost of the job. Further, a fillet of smaller section is required to obtain a given strength with a good-quality covered electrode; therefore a smaller deposit is needed and, more important, time is saved.

It is worth the consideration of all engineers concerned with electric arc welding to interest themselves in the technical and practical advantages of various types of electrodes, since there is no doubt that the latter are the key to efficiency.

The Quasi-Arc Co., Ltd., is particularly well equipped to demonstrate the claims made for its electrodes, and a recent visit to its laboratories proved of much interest and educational value.

The "Quasi-Arc" electrode consists of a steel wire wrapped with a blue asbestos yarn possessing certain peculiar qualities. Blue asbestos is a ferrous silicate and a natural flux suitable for the cleaning and protection of molten steel. It is also a heat insulator, and, therefore, a medium whereby the heat of the arc may be concentrated and directed to the quarter where it is required. This results in a stable arc completely enclosed in a protective envelope of flux.

Efficient protection of the molten steel from the air is afforded by this envelope, thus preventing the formation of iron oxide and other impurities in the resultant weld. The high thermal efficiency of the flux-shielded arc affords it great power of penetration, so that it can be operated at considerably reduced current density, with the result that the heat input is so limited that brittleness is not produced in the parent metal by overheating.

The company has given considerable attention to the elimination of all corrosive agents in designing its electrodes in order to ensure that the weld will be homogeneous and free from oxide, and other defects. The deposited metal is therefore pure and electro-negative to the surrounding metal, so that the effect of corrosive action is thrown on to the greater area of the surrounding metal rather than on to the weld.

Types Available

There are eleven types of electrodes manufactured by the company, all with cores of various diameters, according to the size and nature of the work for which they are required. Except for the smallest size, No. 14 s.w.g., which is made in 12-in. pieces, they are all supplied in 18-in. lengths.

Mild-steel electrodes (blue) are intended for the general welding of wrought-iron or mild steel, for constructional work, tanks, wheel tyres, steel castings, &c., and electrodes are available for the same classes of work where the weld has to be made in overhead or vertical positions.

Uranium electrodes (brown ends) were produced to meet the demand for a very tough and ductile deposit for special work where welded joints of the highest efficiency possible are essential, such as in the construction of high-pressure vessels, boilers, bridges, &c. The special core deposits a weld metal having physical properties similar to those of high-grade mild steel. Uranium overhead electrodes (green) are also available.

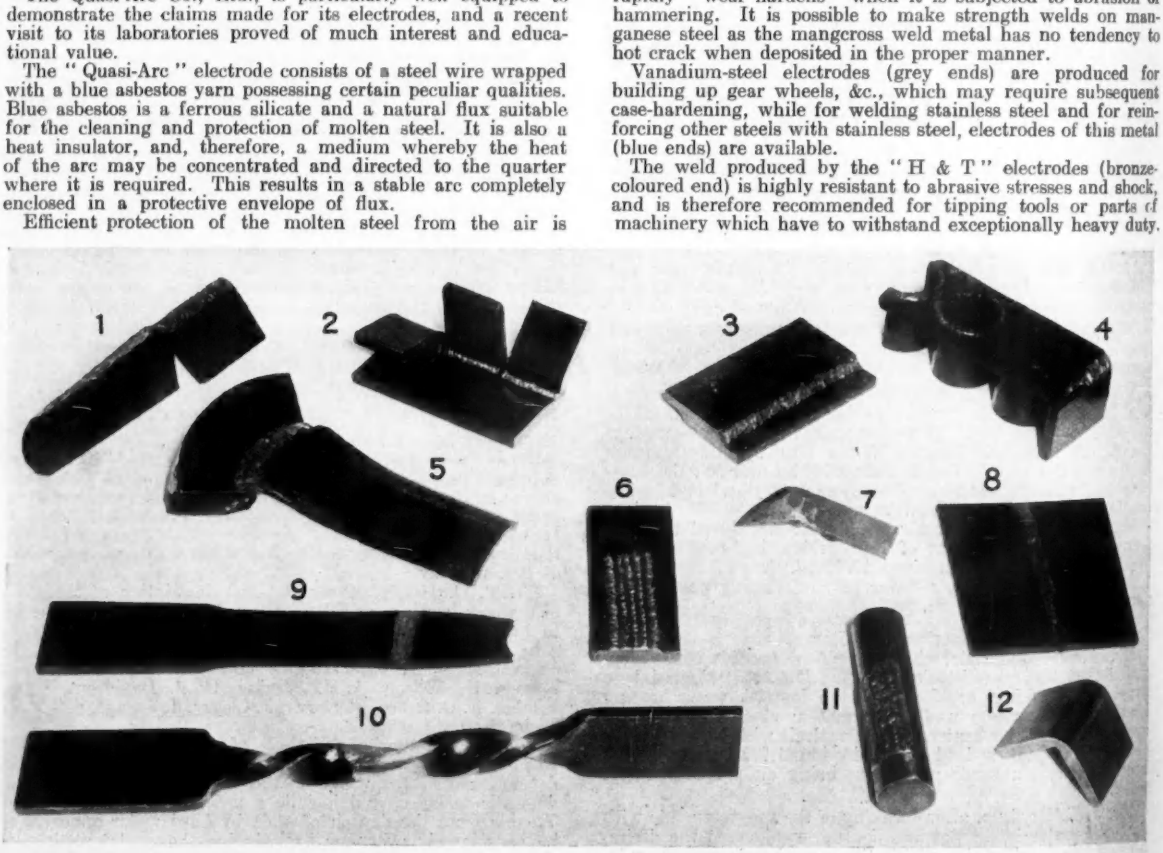
For the repair of iron castings, leaving a soft machinable deposit, special (yellow) electrodes are available, while a range of carbon-steel electrodes (red) serves for reinforcing worn parts of machinery, teeth of steel gear wheels, steel wobbler ends for rolling mills, points and crossings, &c.

Manganese-steel electrodes (black ends) are designed for reinforcing parts of the same materials, as in crusher jaws, dredger-bucket lips, &c.

The metal deposited by "mangcross" electrodes (green ends) is an austenitic steel, tough and comparatively soft, but it rapidly "wear hardens" when it is subjected to abrasion or hammering. It is possible to make strength welds on manganese steel as the mangcross weld metal has no tendency to hot crack when deposited in the proper manner.

Vanadium-steel electrodes (grey ends) are produced for building up gear wheels, &c., which may require subsequent case-hardening, while for welding stainless steel and for reinforcing other steels with stainless steel, electrodes of this metal (blue ends) are available.

The weld produced by the "H & T" electrodes (bronze-coloured end) is highly resistant to abrasive stresses and shock, and is therefore recommended for tipping tools or parts of machinery which have to withstand exceptionally heavy duty.



Examples of welded joints and reinforcements made with flux-covered electrodes: 1, corner weld made with uranium electrodes, partly sawn and forged out; 2, mild-steel electrode corner weld with saw cuts, one end opened out and the other closed in cold, centre portion as welded; 3, lap welded joint; 4, procedure in welding transformer-tank corner and tube to tank welds; 5, segment of welded pipe flange, portion of pipe bent over; 6, plate reinforcement; 7, edge of coal-cutter tooth welded with "H & T" electrodes; 8, preparation of plate edges for butt weld and first and second layers of weld metal; 9, result of tensile test, break clear of weld; 10, butt-welded joint with uranium electrodes, heated and twisted without fracturing weld; 11, shaft reinforcement; 12, stainless-steel tank corner with s.s. electrodes

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

These Discounts

I have read with interest the article by "Vanadis" under the above heading, and I must say that I find it hard to believe that he is concerned with the selling of motors rather than the purchasing side, as I do not consider that he has given the motor manufacturer the credit which is surely due to those who do their best under trying and adverse circumstances.

Let us look at the question solely from the motor manufacturer's point of view.

Not considering for the moment the operation of the present association which is alleged to control industrial motor prices, it will be agreed that the net economic price of any article should be based on the cost of production. The net cost is the lowest price at which the article can be sold to any class of customer at a fair profit. The motor manufacturer has at least three classes of customer on his books—the factor or wholesaler, the trade or reseller, and the user. The wholesaler, generally speaking, is not prepared to tie up his money in stocks or give any special form of selling assistance; further, as a general rule, he knows rather less about the installation and care of motors than the actual user, and any query or complaint is almost invariably passed on to the maker with a letter of abuse which in nine cases out of ten shows his complete ignorance of the subject on which he is writing.

This lack of knowledge usually ends in the manufacturer sending a service engineer along who clears things up and leaves the user convinced that it is the best policy to deal direct with someone who knows his job. The average number of orders received from wholesalers is about 1 per cent. of the total motors sold, and yet the manufacturer is expected to increase his price to the other 99 per cent. in order to give preferential terms to his smallest customer.

Then there is the trade or reseller class, into which category comes the biggest assortment of customers, including machine-tool makers, electrical contractors, leather merchants selling boot-repairing machinery, butchers, brewers, fishmongers' sundriesmen, and a host of others, not forgetting John Brown, who is an electric wireman at the XYZ Motor Co. by day, and a "qualified" electrical engineer and contractor on Saturday afternoon and Sunday.

A great many of these are excellent customers, but few, if any, carry stocks or buy more than one or two machines at once. Many of them, owing to carelessness or ignorance, order motors of wrong voltages, periodicities or phases, and expect the manufacturer to take them back into stock without any charge. They also make optimistic requests for special designs or mechanical alterations, and expect delivery from stock at the standard price.

However, many of these are valuable customers, and usually the manufacturer goes to considerable trouble to comply with their requests, often at an appreciable loss to himself. Generally speaking, it is the user with his own electrical staff who is the best customer, and in view of the fact that the trade does not enter into the transaction in any way, who can blame the manufacturer for quoting his lowest price when he knows that he is certain to be up against keen competition?

Most manufacturers of repute endeavour to find out the nature of their customer's business when quoting, and base their prices accordingly, but it must be admitted that it is very trying to have taken a great deal of trouble to sell a motor worth, say, five pounds, only to have some trade customer ring up later to ask for commission on something which he made no individual effort to assist in selling.

The electrical trade could easily justify its demand for better treatment by endeavouring to create a demand amongst its customers for small motors for various purposes. If this principle were extended the trade would find that every assistance would be forthcoming from that much-maligned individual the electric motor manufacturer.

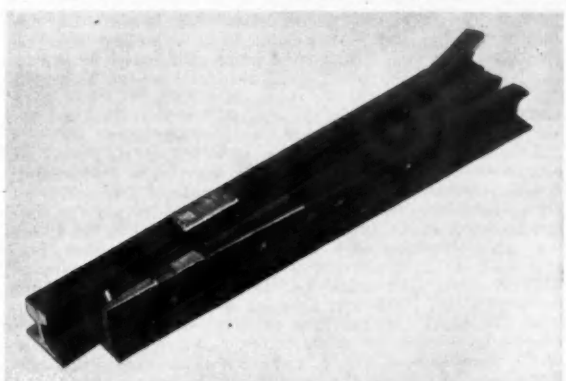
FAIR PLAY.

January 25th, 1932.

Still the Boiling Plate

I am quite convinced that the only hope of a satisfactory electric boiling plate lies in the adoption of radiation instead of conduction for heat transfer.

There is no difficulty whatever about designing an efficient open-type plate. One in which the element spirals are carried on light refractory rods with a reflector underneath attains its maximum heat output in about a minute. On test a plate of this kind boiled two pints of water from cold in eight minutes with a loading of 1,500 W, and without any special utensils. This is better than any enclosed plate, and with very small quantities of liquid. The superiority is much more marked on account of the low thermal-storage capacity of the plate. With one of the plates loaded at 2,000 W this type would completely satisfy the housewife, but it would not answer in practice on account of its liability to damage.

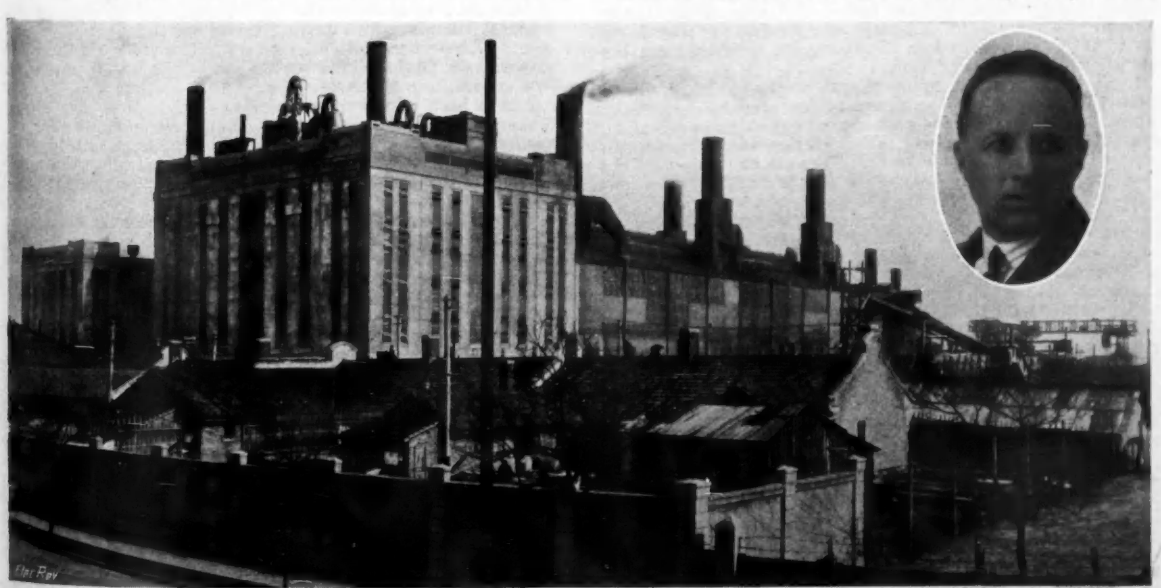


Welded reinforcement of worn railway points. (*See opposite page*)

The problem, then, is to provide adequate protection without unduly increasing the thermal-storage capacity. Perhaps an open plate could be made practicable by adopting a simple and fool-proof plug-in element.

Then a few spare elements could be supplied with each cooker, and a visit from the maintenance man would only be necessary when the last spare had been fitted. This would greatly reduce maintenance costs of which a greater portion is probably represented by labour than by materials.

If the difficulties of obtaining a sufficient degree of protection



In the news: The Shanghai Riverside power station and (inset) the chief of the undertaking, Mr. C. S. Taylor

without a serious reduction in efficiency cannot be overcome, I believe that the transformer type will have to be universally adopted. The stout resistor which the transformer renders possible makes it a simple matter to design an open plate with a low thermal-storage capacity since no refractory support is necessary for the element and no protection is required.

Unfortunately the extra cost and bulk of the transformer makes the use of more than one of these plates hardly practicable on a domestic cooker. It is possible, however, that in the future transformer sizes and costs will be reduced by the adoption of special alloy cores and windings of new high-conductivity alloys which are already rumoured. This is, however, rather too much a matter of the future to affect the immediate development of boiling plates.

In conclusion, I should like to endorse the proposal for exhaustive tests of all kinds of plates under varying conditions by some independent organisation. The results of such tests would be most instructive to anyone interested in the development of a really satisfactory electric boiling plate.

Monkseaton, *January 23rd*, 1932. W. B. PARKER.

In your issue of January 22nd, Mr. G. C. Hadfield refers to the results obtained by inserting a 1,000-W immersion heater in a machined-bottom aluminium kettle. He finds that by placing this kettle on a 1,000-W boiling plate and simultaneously switching on the immersion heater he can boil three pints of water in a fraction over six minutes, thus pointing to the importance of speed in boiling, "even at the expense of efficiency." In my opinion it is preferable to obtain the same or better results and maintain efficiency.

I have made tests upon a standard 2,000-W six-pint aluminium kettle containing a 2-kW immersion heater, and I find that with an initial water temperature of 58 deg. F., and an ambient room temperature of 62 deg. F., three pints of water can be boiled in 5 minutes 21 seconds. In the tests the voltage was maintained correctly at 200, and the total consumption was 0.194 kWh, which shows an efficiency of approximately 87.3 per cent. The actual loading of the element was apparently 2,180 W, instead of 2,000 as specified.

Mr. Hadfield does not give sufficient data to allow of an exact comparison, but if we consider the initial temperature of the water to be 58 deg. F. in his case also, and, furthermore, if we can be definitely assured that the loading of the plate was exactly 1,600 W, and that of the kettle 1,000 W, then the efficiency would be a fraction under 65.1 per cent.

Mr. Hadfield can find only three snags in his method. I might suggest a fourth: if his kettle were placed upon the hot-plate it is more than probable that the busy cook would burn off the flexible connection by allowing it to come into contact with the plate. The standard kettle obviates all four of these snags and, moreover, the cost is not more than that suggested by Mr. Hadfield.

It might be of interest to note that several independent observers were recently asked to boil three pints of water on their gas stoves under home conditions. The time of boiling varied between 7 and 7½ minutes. A three-pint electric kettle loaded at 1,000 W will boil sufficient water for the early morning cup of tea in about 3½ minutes.

W. P. CONLY.

Southampton, *January 26th*, 1932.

We are somewhat reluctant to prolong the discussion of this admittedly difficult subject, but its importance to the electrical industry, and particularly to the cooker section, is so great that as manufacturers both of the immersion type elements (to which Mr. Hadfield presumably referred in his letter published in your January 22nd issue), and also of the heavy ground-base utensils for hot-plate use, we feel we may fairly claim to be unprejudiced in discussing the question from the utensil makers' point of view.

In the main we are in complete agreement with Mr. Hadfield—certainly as regards the necessity for accelerating boiling times, and we have in the past carried out experiments along the suggested lines, namely, the inclusion of an immersion element in a ground-base kettle. There is one objection not mentioned by Mr. Hadfield, which in our opinion constitutes a serious handicap to the scheme. Unless extremely intelligent use is made of the cooker switch by anticipating the boiling time and switching off the plate early enough the combination of internal heat and the latent heat of the hot-plate give sudden and uncontrolled boiling which increases the difficulty already inseparable from the present enclosed boiling plate, which is only second to its slowness as a handicap to its use.

In addition, the fact that a separate connection would be necessary for this special kettle, though simple enough when only a kettle is under consideration, would add another point on which the new user would need instructions, and would lengthen the already formidable list of directions for the use of the hot-plate which harassed demonstrators have to try to get over to the user.

A boiling time of approximately 5 minutes for 3 pints can be obtained by using a standard 6-pint immersion kettle and half filling it. As marketed, these kettles have a loading of 1,800 W, and in addition the rapid boiling desired is achieved with the high efficiency associated with this type of element. There is the added merit of portability of the kettle which can be safely used anywhere—thus ruling out another of Mr. Hadfield's "snags." Finally, it has a large capacity where this is occasionally needed.

It is true that there will always be a necessity for ground-base kettles and utensils so long as the enclosed hot-plate persists, but we suggest the following alternative to Mr. Hadfield's scheme:—Use a large immersion kettle with this high loading and high efficiency for the first boil, and use the ground-base kettle when the plate is hot during ordinary cooking operations. This method has been used successfully, and demonstrated by a number of supply undertakings, and in our opinion is the best solution to the problem which can be put forward at present.

The mistake most frequently made where the independent kettle has not proved sufficiently rapid to meet competitive requirements is that one of too small a size has been used, and, as Mr. Hadfield rightly points out, the loading of such a kettle, however efficient, gives a boiling time which hardly competes with the gas ring in speed.

BULPITT & SONS, LTD.

Birmingham, *January 29th*, 1932. T. B. Bradley.

I think most of us quite agree that there is plenty of scope for development in the present hot-plate, not only in speed, but also in efficiency and durability. I do not, however, agree that our manufacturers are trying to evade the issue. They are very much alive to the facts and the importance of an early development for the good of the industry in general.

No doubt we are in difficulty, but it seems to me that we are trying to rectify an article which is inefficient. For instance, we suggest the use of flat-bottomed utensils. These only remain flat for a time and then they become worse than the ordinary type.

Incorporating a gas ring is merely an admission of failure and at the same time a suggestion that further improvements cannot be made. The immersion heater is more of a novelty than a practical proposition. It has seemed to me for some time that research should be made more on unconventional lines.

I am developing a line of cooking apparatus which I feel will be greatly in advance of anything yet on the market. A quick-boiling plate will be one of the features. I do not wish at the present moment to enter into details, but conclude by mentioning that I can boil two pints of water in about four minutes at approximately a third the cost of the ordinary hot-plate.

Solihull, near Birmingham, N. W. GILBERT.
February 1st, 1932.

The Installation Problem

Mr. S. A. Hughes, in your issue of January 15th, says that he would couple one side of the heating elements in consuming devices "to the body of the article and connect them by a two-conducter flexible to a non-reversible plug and socket" having one side earthed.

What happens when the earthed side of the flex breaks (one side *must* break first) and leaves the whole device alive at full potential?

January 29th, 1932. T.T.T.

Jerry Wiring

With reference to the leaderette on this subject in your issue of January 8th, I think it quite unfair to say that members of the Electrical Contractors' Association suffer from unfair competition from contractors outside the Association. In some cases it is so, but not in all. I have been a contractor on my own account for the past 12 years. I carry on my business from my own private residence and do not employ labour; I have been bitten on several occasions so do the work myself with the help of a boy. On this account I am barred from joining the E.C.A.

I have been in the trade for over thirty years, and all my material and workmanship are guaranteed and open for inspection. I agree with Mr. E. Tippins's statement in your issue of January 22nd that the supply companies are the worst offenders in connecting up any job and allowing anybody to do the wiring.

Some years ago when I was in my apprenticeship the supply company had to be notified when any new job was started and an inspector visited the job at intervals and watched it as it was proceeding. I think this ought to be enforced as it would stop some of the jerry wiremen; I should be very pleased to have such a position.

At the present time with so much wireless on the mains there is a great deal of flexible wire hanging about, put up by amateurs and quite unsafe.

Take Norwich as an example: I have applied to the Corporation to be allowed to wire a plug permanently with c.t.s. cable and a pair of cut-outs with very light fuses on to their free-wiring jobs, but I have not been allowed to do this. People will not pay the price of a better job and consequently they do it themselves in a haphazard manner.

The so-called "handy man" is a great danger, and until something is done to stop his activities it will always be considered that contractors' prices are too high. There are a great many good tradesmen unemployed through this.

I hope that in future contractors who are not members of the E.C.A. will not all be classed as "jerry wiremen."

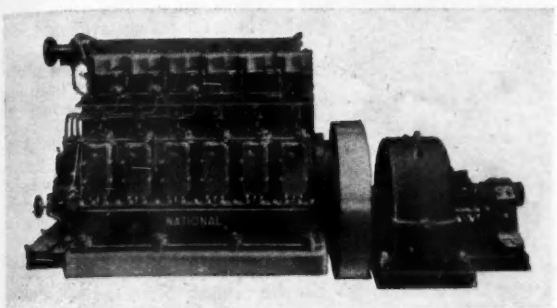
Norwich, *January 27th*, 1932. J. TICEHURST.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Six-cylinder Heavy-oil Engine

The latest addition to the range of heavy-oil engines produced by the NATIONAL GAS ENGINE CO., LTD., Ashton-under-Lyne, is the "RV6," a six-cylinder model which, at normal atmospheric temperature and pressure, and using fuel oil having a net calorific value of not less than 18,000 B.th.u. per



The "RV6" heavy-oil engine (165 b.h.p.) driving dynamo

lb. and a specific gravity not exceeding 0.92, will develop 165 b.h.p. at 600 r.p.m. The engine starts from cold on compressed air and takes up its load immediately afterwards

It operates on the four-stroke cycle. All the working parts are totally enclosed, and the bearings are forced lubricated. Like parts are interchangeable, being machined in jigs. The overhead inlet and exhaust valves are of special steel and are operated by totally-enclosed push-rods and levers. Each cylinder is fitted with a separate fuel pump and atomiser, the fuel-pump plunger being operated through an adjustable tappet by a case-hardened steel cam. A centrifugal governor mounted on the crankshaft determines the effective portion of the fuel-pump stroke, the oil being by-passed earlier or later in the stroke as the load decreases or increases.

Flexible Lead

A recent production of CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Victoria Embankment, E.C.4, is "Ankaflex," an unkinkable flexible lead for domestic appliances supplied in all standard sizes up to and including 162/0.0076 (0.007 sq. in.) twin and three-core, and in standard colours red and black.

Each conductor is insulated with one layer of special pure rubber and two layers of vulcanised india-rubber of C.M.A. 600-megohm grade. The cores are wormed together with a heald cord laid in each of the interstices and filled to a true circular section with the maker's special flexible, durable and waterproof material—"Ancalite," the whole being finished with a closely woven braid of high-quality glace cotton which under ordinary use will not unravel at the ends. The heald cord strengtheners enable the flexible to be securely anchored at each end to prevent strain on the conductors.

Water-level Indicator

A new pressure and altitude gauge with which is combined an ingenious overhead-tank water-level indicator, the invention of Mr. Sydney A. M. Rose, 4, Hurlingham Court, S.W.6, is being manufactured by the BUDENBERG GAUGE CO., LTD., Broadheath, near Manchester. It can be installed permanently in five minutes by simply screwing it into the existing pressure or altitude gauge socket, etc., without interrupting the service in any way.

"Rose" water-level indicator

An audible alarm indicates abnormally low water, frozen tank, feed-pipe obstructions, &c.

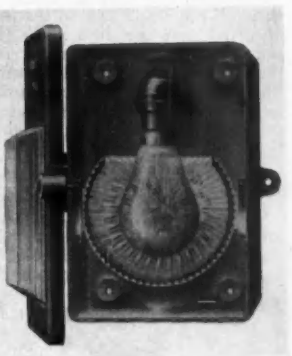
In one method of employment the pointer-carrying member of the pressure-operated gauge has an adjustable toothed rack or quadrant so arranged that it engages with and commences to operate a geared pinion, which in turn moves a pointer over a separate enlarged scale to indicate the various levels of the elevated tank. The water-level indicating pointer, pinion and carrying member—which move in common—are so balanced that when they are disengaged from the quadrant teeth the pointer tends to gravitate by the action of an over-balancing member to that end of the scale it happens to be nearer to, and the pointer or its carrying member is provided with a contact so arranged that it makes or breaks circuit with a second contact attached to the adjustable stop of the water-level scale. The contact members are for the purpose of making or breaking one or more electrical circuits for the operation of the audible or visible alarms, or signals and/or other mechanism used in connection with the system, such as for the control of pumps, valves and the like.

Industrial Bulkhead Fitting

The latest prismatic bulkhead fitting introduced by the WARDLE ENGINEERING CO., LTD., Old Trafford, Manchester, has been specially designed for use where head-room is restricted, and a well-directed lateral light is necessary to provide midway illumination.

It comprises a cast-iron body with a hinged lid, an interior prismatic reflector of approximately spherical contour, and a dish-shaped rectangular front refractor glass with a smooth exterior.

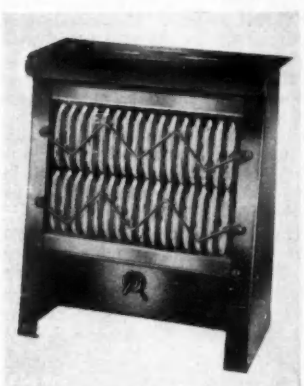
Lateral lighting is accentuated by the interior prisms of the refractor, and the combination of the interior reflector and the exterior refractor enhances efficiency. The position of the lamp filament is such that a wide-angle beam is provided. The porcelain lampholder is carried in an adjustable yoke, permitting correct focusing for 40/60-W lamps.



Wardle prismatic bulkhead fitting

Easy maintenance is a feature of the construction, the fitting being robust, dust-proof and watertight. A top-entry ¾-in. conduit tapping is standard, but tappings up to 1-in. conduit can be provided, with also bottom, side or back entry.

Simple Fires



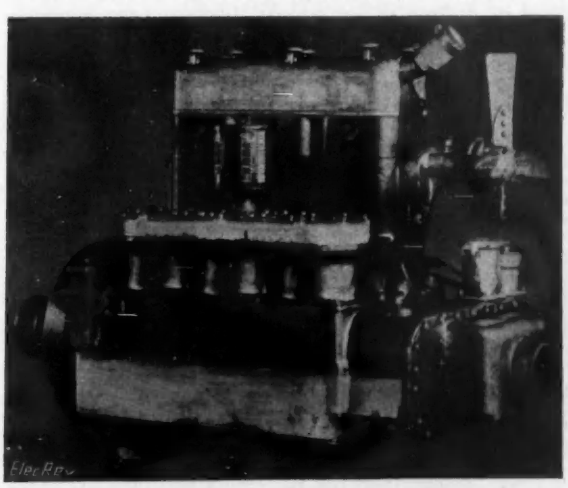
An "Eddo Service" fire

Simplicity of construction and low initial cost are the main features of the new "Service" fires introduced by MESSRS. H. G. MOSELEY & CO., LTD., Hospital Street, Birmingham. The range provides loadings of from 750 to 2,000 W, with a switch controlling one bar in the two-bar models.

Each fire has a flat top suitable for plate warming, etc., and is provided with a carrying handle. The oxidised-copper finish is distinctive and, in conjunction with the polished reflectors, results in an unusually attractive appearance for such low-priced apparatus.

High-speed Diesel Engine

The new high-speed compression-ignition engine introduced by MESSRS. PETTERS, LTD., Westland Works, Yeovil, operates on the two-stroke principle and has a compression ratio sufficiently high to allow easy starting without pre-heating devices. The combustion space is of simple design, avoiding pre-combustion pockets in either cylinder or piston, and giving easy starting from cold. The cylinder bore is 4½in. and the piston stroke 5½ in., and with three working cylinders the engine develops 36 b.h.p. at 1,200 r.p.m. The scavenge pumps are chain driven at engine speed, and deliver air through ports in the wall of each cylinder. The fuel pumps and atomisers are of "Bosch" manufacture, and work at a comparatively low pressure. A



A Petter compression-ignition engine

chain drive is arranged for the fuel and water pumps, together with the dynamo. A governor coupled to the fuel-pump shaft cuts out the fuel pumps when the engine reaches its maximum speed, and also provides for low-speed running at about 300 r.p.m. A starter motor is provided with its piston engaging a gear ring on the flywheel, and an accessible fuel-oil and "Proctomotor" air filters are fitted. Forced lubrication is provided.

The engine is designed for both three-point and four-point suspension. Monobloc main cylinders are used, bolted through the crank case to the inverted main bearing caps, thus ensuring that the high loads due to the cylinder pressure are not sustained by the crank case, which carries the weight of the engine only, and is connected to the chassis by arms. The weight of the engine complete is 12 cwt., "Alpax" aluminium alloy and other special materials being used wherever possible to reduce the weight to the lowest figure compatible with strength.

A Home Radiation Outfit

Visible, infra-red and ultra-violet rays in correct natural-sunlight proportions are claimed to be yielded in the radiation from the "Osram" ultra-violet lamp produced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. By simply switching on a gentle flood of artificial sunlight is immediately available, and although it is advisable not to stare directly at the arc the wearing of goggles is unnecessary. The light, while being more efficient for its purpose owing to the greater output of the ultra-violet ray, is pleasant and not too concentrated.

"Osram" radiation equipment

The unit comprises a standard finished in Florentine bronze with an adjustable bracket, so that the height and angle of the lamp can be varied at will. The standard is mounted on a cast base fitted with castors, and it may therefore easily be moved about. A transformer is mounted in the base and is protected by a domed cover, suitably ventilated. The reflector, adjustable to suit any requirements, is of dull aluminium, which is believed to be the most suitable material for reflecting ultra-violet rays.

The lamp proper comprises a glass bulb containing a filament between two cylindrical tungsten electrodes, and a pool of mercury. When first switched on, the filament lights up and vaporises some of the mercury, and after about 5 seconds an arc is automatically struck between the electrodes. The greater part of the visible and infra-red rays emanate from the filament and the electrodes, while the ultra-violet radiates from the arc. The glass bulb is transparent to the ultra-violet and infra-red rays, but filters out the undesirable short rays.

The secondary winding of the auto-transformer has been carefully adjusted to suit the peculiarities of the lamp. When the filament lights up the transformer supplies 10 A at 30 V, but with the striking of the arc between the electrodes the current at once rises to 30 A and the volts drop to 10. The standard transformer is supplied for 50 cycles only, and is not suitable for use on other periodicities. Three transformers cover the normal voltage range, and these have primary tappings suitable for the following voltages: 100/105, 200/210/220, and 230/240/250. The outfit is 68 in. high, and weighs, complete, 63 lb.

A Metal-clad Switch-fuse

The first two units, d.p. and t.p., 15 A, 500 V, of a range of "Black Prince" switch-fuses have recently been introduced by SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham. They are of lighter construction than the makers' standard "S.E.S." gear, and hence cheaper.

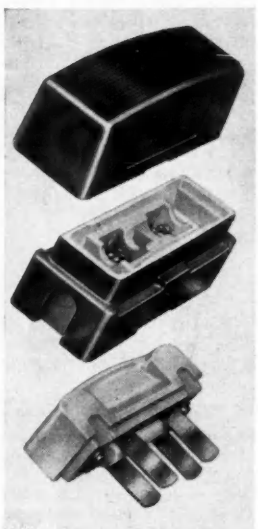
The composite case is of pressed steel and grey iron, black stove enamelled throughout, and has two ¾-in. knockouts at the top and four fixing holes inside. The switch mechanism is of the standard "S.E.S." reciprocating pattern, with a quick-make and break movement and removable blade assembly of hard-drawn-copper blades rigidly mounted on a solid "Bakelite" bar. Self-aligning, phosphor-bronze switch contacts are employed, while rubber stops are provided inside the cover to keep the fuse handles in position.

"Black Prince" switch-fuse

The fuse units and switch bases are made of British vitrified steatite. Although very compact the complete unit has ample electrical clearances.

Insulated Service Cut-outs

A new model of the "Isco" cut-out has been developed by MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1, to meet the needs of engineers who prefer to insulate rather than to earth electrical apparatus, thus providing an alternative to the existing models in c.i. cases.



The "Isco" insulated cut-out

The object of the designers has been to comply in every way with British Standard Specification No. 88, 1931. Three ranges are available: for 15 to 30 A; for 30 to 60 A; and for 60 to 120 A. Each model comprises a porcelain base and carrier, the latter being enclosed in a "Bakelite" cover which is required for mechanical protection. The tinned copper fuse wire is threaded through a small-bore asbestos tube; with the fuse carrier in position the tube is literally enclosed in porcelain. Each end of the tube communicates with a relatively large expansion chamber formed in the porcelain base and carrier, where the volatilised metal and gas produced by the blowing of the fuse is quickly cooled and the pressure reduced.

For fixing, a stainless-steel spring clip with four teeth punched outward and a single rust-proofed screw provide a simple arrangement, the screw passing through the base, the clip, and the back board; the four teeth also press into the latter, preventing any turning movement. The clip holds the "Bakelite" cover in position, and the ends of the clip are provided with holes for sealing.

Tests carried out at the National Physical Laboratory to ascertain the behaviour of these cut-outs under short-circuit conditions were satisfactory. The heavy-duty 260-V battery was used for making six tests on each type of cut-out, giving maximum currents of 1,500, 2,000, and 4,000 A, respectively. In every case the terminals were serviceable throughout the tests. Only in the case of the 60-A size was there any appreciable pitting of the terminals.

Oscillograms showed that the pre-arcing energy was roughly proportional to the mass of the fuse. It was not directly proportional to the rating, as the length of the fuse increases with the rating. The post-arcing energy, which is dissipated in damaging the cut-out, was very small, and had an almost identical value for each output.

Unlike the pre-arcing energy, which is governed almost entirely by the mass of metal to be heated, the post-arcing energy is practically independent of the mass of the fuse. The arc was active in the cut-out for only 0.0011 to 0.0017 sec.—less than one-tenth of a cycle of the standard a.c. supply. The oscillograms taken of six tests show little difference between the first and the last of the series.

Small M.I. Instruments

Ranges of moving-iron ammeters and voltmeters, a.c. and d.c., have been produced by MESSRS. ERSKINE, HEAP & CO., LTD., Caroline Street, Broughton, Manchester, to meet the demand for a small, low-priced, robust and reliable instrument. The design is similar to the makers' 4-in. square and 6-in. and 8-in. round instruments, and is fitted with sapphire jewels. Easy external zero adjustment is provided for by the standard spring control, and efficient damping renders the instrument practically dead-beat.

Erskine Heap M.I. ammeter

The accuracy is first grade in accordance with British Standard Specification No. 89, when used on a.c. (up to 100 cycles) and d.c. circuits. Six sizes up to 100 A maximum complete the ammeter range, while there are twelve sizes of voltmeters up to 600 V maximum, the five larger sizes being of the external-resistance type. The instruments have a 2½-in. scale.

A Rubber Substitute

From the claims made for their product, "Dexine," by DEXINE, LTD., Abbey Lane, Stratford, it seems that the material should be of considerable use in the electrical industry. Briefly, it is a composition of vulcanised india-rubber and other pure ingredients manufactured under a special process. It is also of a very tough and frictionless nature, capable of withstanding extreme temperatures, and is impervious to the deleterious action of acids, gases, ammonia, oils, greases, etc. Any article usually made of ordinary india-rubber may also be produced from the material.

Dietetics in the Stores. By H. R. Taunton

Food for thought for contractors

LET us look a little farther into the question of the contractor's store.

Keeping stock in efficient working order is very much the same as keeping a dog in good condition: a question mainly of diet and exercise. Feed a dog grossly and carelessly and let him lie all day in his kennel, and presently you will find him a bloated, mangy cur, neither beautiful nor useful. Cram your stores with needless surpluses and worthless rubbish, never turned over from one year's end to another, and one day you will wake to the fact that your basement is occupied by a voracious white elephant, an ugly brute, unwanted and unsaleable.

The first essential, then, is to keep the stock within workable limits by putting it on a strict diet. To this end there is nothing better than the adoption of the well-known, but too rarely used, system of minimum and maximum quantities. Every bin or other receptacle in the store should bear an index, a description of the contents and, in big bold figures, two numbers representing the limit below which the particular item of stock should not be allowed to fall, and that which it must not exceed.

These minimum and maximum figures will naturally vary with the size and the peculiar needs of the business, and they may vary too from time to time. They may be tentative at first, until experience dictates the most suitable limits. The important point is that they should be kept as low as possible and, once fixed, rigidly adhered to.

Discounted Discounts

A common reason for buying excessive quantities of stock is the temptation of a quantity discount. But what is the point of earning an extra 5 per cent. by buying more than is needed, if it is lost in the first year in the shape of interest on capital standing idle, and much more than lost by depreciation if the goods are stored for more than a year? The adoption of maximum limits would effectively check such misplaced enterprise.

The system of maxima and minima, while it is a check on the undue accumulation of the classes of material to which it is applied, does not of itself prevent the total volume of the stock exceeding its prescribed limit. Stock may grow by excessive variety as well as by excessive quantity. Only constant scrutiny of the stock list will stop the gradual addition to it of scores of unnecessary items and endless sub-varieties of necessary items.

The buyer may have been tempted by some maker's novelty or deceived by a spasmodic demand; the storekeeper may have been forced to give room temporarily to some unusual material returned from a contract. As soon as these intruders are detected they should be allotted a maximum limit of "O," so automatically preventing their renewal; unless, of course, or until, careful judgment or experience dictates the advisability of making them permanent stock items.

All such additions to the varieties of material should be made grudgingly and sparingly. It is folly for a contractor to attempt in his store to cover the range of a wholesale catalogue. Normally he should be content to have at hand no more than the bread-and-butter stuff of jobbing and maintenance work, in regular demand. If he finds a particular item figuring without alteration in two successive stock lists he will do well to write its maximum down to "O," so that it may gradually be eliminated.

Keeping Constant Watch

Another important check on the unhealthy growth of stock is the use of what is known as a perpetual stock list. "The use" means not merely the clerical compilation of the list but the automatic reference to it before any goods are ordered against requisition. That means, further, consideration in each case by the buyer or storekeeper of the possibility of substituting some stock item for a slightly different item requisitioned. For example, it might well pay to send a foreman a length of 19/064 from stock when he asked for 19/052. This would not only save the 10 per cent. extra which would have to be paid on the cost of a short length, but would be maintaining the principle of keeping the stock moving.

That principle is important enough to justify many of these apparent sacrifices, provided they are not excessive. There is an old story of a joiner who, whenever he got an order for a special job, was wont to look over his stock of choice woods, and invariably decided that all his specimens were too good for it, so that he had to buy what was wanted. When, in course of time, his creditors came in their turn to look over his stock they found all his choice pieces warped and split and worthless through age. The moral may easily be applied to the electrical contractors' stock.

Stock is apt to become unduly swollen temporarily—and, if the occasion is neglected, permanently—both in variety and quantity, by returns from large contracts of material ordered in excess of requirements. That, if consistently recurring in abnormal proportions, argues a fault in the foreman or supervisor or buyer; but circumstances often make it excusable. All that can be done is to minimise its disruptive effect on the stores organisation.

If the quantities are large—dozen lots, uncut coils and so on—or are special items of value—a fitting or a circuit breaker, for instance—every endeavour should be made to induce the suppliers to take the goods back for credit. Even if they do not credit the full value, or if they make a charge for reconditioning, almost any reasonable sacrifice is better than a departure from the principles of maximum limits and of avoiding immovable stock.

Obliging Factors

Most factors will be found willing to oblige a good customer, and, in return for definite contracts extending over a period, to allow him to order odd lots at quantity prices. Whenever such an arrangement can be made, it minimises the need of ordering for stock, as the exact quantities requisitioned by foremen can be ordered for direct delivery, without any sacrifice of favourable terms. As an extension of the arrangement, it is sometimes possible to induce a factor to accept the return of odd lots on the same terms. In this way a contractor, with a little diplomacy, can achieve the very desirable end of having the bulk of his working stock kept for him by his factor.

Any items returned from jobs which are usable on some other current job should be immediately transferred to it without passing through the stock list or being handled in the stores, beyond necessary checking and repacking. Odd lots which cannot be returned for credit must be treated as ordinary accretions to stock: permanent, if they are standard items and do not involve an extension of a maximum limit; temporary, if they do, or if they are unwanted new varieties, in which case they are given a zero maximum, as before suggested.

Disposal of Deteriorated Material

Finally, stock is apt to grow, with an increasingly stagnant proportion, by the gradual accumulation of slightly damaged or deteriorated material, generally originating as returns from contracts. If this is stored away without discrimination among the good stock, the result will be that in time it will form the large nucleus of it, unused until it becomes unusable, and with a value which with every year will be less and less than its nominal value in the stock list. There is a natural tendency for anyone selecting material for a job to prefer the new unopened coil of flex, or the accessory still in its original carton, to the slightly shabbier article.

Any returns or material slightly depreciated by handling in stock, but still sound and usable, should be kept in the forefront of the bins, and the rigid rule observed that it must be cleared before any new material in the makers' packing is touched. Cable and flex should be neatly coiled and labelled with the correct lengths, using the makers' labels if possible. Small accessories such as switches and ceiling roses should be put back in the original cartons if these are available. Articles like white enamelled blocks, easily soiled, should be wrapped in paper. In short, all this not-quite-new material should be treated as tenderly as if it were new.

An Intermediate Class

The procedure is not so simple with stuff which, while quite sound, is yet too markedly depreciated to be usable on new work. To store it with the new stuff means that it will be counted in with it, to swell the stock list with fictitious totals; while to segregate it would mean a large number of extra bins, and a consequent overhead cost out of proportion to its value. Probably the best compromise is to let it remain in the usual bins well exposed to view and star it as separate items in the stock list, where it can be priced at reduced figures—some simple proportion of the standard cost, such as 50 per cent.

A common case is that of c.i. boxes returned drilled from jobs for which they have proved unsuitable. They may lie in stock for years because nobody takes the time and trouble to look them over when a box with particular drillings is requisitioned. It is always so much easier to take a new box and drill it as required. It is a good plan to have a large chart, which may consist of several tough sheets clipped together, classified according to the various overall sizes, and showing by rough diagrams the actual drillings of each box in the bins. It is easier and quicker to consult such a chart

than to turn over a mass of heavy ironmongery all looking very much alike.

C.i. goods in general—fuseboards, main switches, w.t. accessories—need rarely prove permanently bad stock, as a touch of enamel will usually serve to make them presentable. With porcelain, "Bakelite" or brass material, badly scratched or tarnished, the only thing to be done is to keep it well in view, use it up at the first opportunity—for instance, on temporary work—and in the meantime take care that it does not rank in the stock list as new material.

Damaged Goods

Goods actually damaged require more drastic treatment. A cursory inspection of three contractors' stores out of four will give an impression of a junk shop. Old arc lamps, obsolete switchgear, battered fittings, eviscerated instruments, torn silk shades, odd scraps of heavy cable, a few mangled telephones, and a burnt-out motor or so; what is the use of cluttering the valuable store space with rubbish like that on the wild chance that it will some day come in useful? It is obviously far better to clear it out for what it will fetch as scrap metal.

Cracked or broken glass, porcelain, "Bakelite" and wood accessories are hopeless. The rest should be sorted out—a corner for scrap iron, another for damaged or short lengths of cable, barrels or packing cases for brass, copper or other metal parts—and periodically sold at the best offer from local dealers.

Apart from such obvious scrap, however, a fair proportion of apparently damaged material can often be salvaged for usable stock. Six tumbler switches may be returned from a job, half with broken bases, and the other half with covers missing. A minute's work by a boy would make of them three sound switches. In any store you will find holders without shade rings, or ceiling roses lacking a terminal, left to indefinite neglect in their bins because nobody has taken the trouble to complete them with the needed parts from others of the same pattern which have been thrown aside as worthless. In the same way, a good main switch will languish until it is obsolete, when it could have been made as good as new by replacing a damaged fuse carrier.

Overhauling Returns

If these small repairs are deferred until the goods are actually requisitioned they are never done. The storekeeper will take the line of least resistance and pass the defective item over in favour of a new one lying to hand for dispatch. It should be somebody's job to overhaul all returns as soon as they come in, and to make sure that nothing is stored away until it has been put in usable condition by replacing damaged or missing parts wherever possible, either from other more defective articles of the same pattern or, where it is worth while, by purchasing the necessary replacements.

It will be seen that the analogy with an animal in training has held good. Limited diet, regular exercise, occasional purgatives, and finally, veterinary attention to the small hurts and ailments which are unavoidable; with these commonsense precautions the contractor's necessary stock can be kept in good condition, in every sense of the word.

The Contractors' Dinner

THE attendance at the annual dinner of the E.C.A. and Allied Associations on Wednesday last week touched a new high record—350. Again there were present many distinguished electrical men representative of all branches of the industry and profession. The President, Mr. W. R. Rawlings, occupied the chair, and the principal guest was Mr. P. J. Pybus, Minister of Transport.

The latter had the handling of the toast of "The Allied Associations and Honorary Officials." He said that as an electrical man himself and as a Minister whose department was intimately connected with the electrical industry it was with pleasure that he found himself at an entirely electrical gathering for the first time since his appointment.

There were present men whose connection with electricity dated from the old bi-polar with its cotton tape and red sealing wax. He made special reference to Mr. John Christie who, he recalled, trotted along the Brighton front thirty years ago in a coach provided by the Corporation, stopping now and again to replace fuses with his own fair hands.

The contractors' calling was a great craft and it lay in their hands to make it greater still; not only the growth of electricity supply, but the potentialities, too, were amazing. Between 350 and 400 thousand people were being connected to the mains annually.

Contact with the Public

The electrical contractor came into direct touch with the consumer—present or potential—and his power to accelerate or retard progress was enormous. Every unsuitable or shoddy piece of apparatus put in and every appliance carelessly installed retarded electrical development. He asked members of the Association to do their utmost to narrow the margin between consumption and generating capacity.

Although this was primarily the duty of the Central Electricity Board the attainment of the object could be facilitated by a straightening out of the load in each of the distributing areas which were within the larger areas of the Board. Much could be done by closer co-operation between the contractor, who was anxious to carry out installation work, and the supply authority, which was anxious to secure outlets for further energy.

The report of the Electricity Commissioners' Committee on the subject of facilitating installation work and the purchase of appliances (upon which the Association was represented by Mr. H. Marryat) showed that considerable scope still existed for the provision by electricity undertakers of facilities for assisted wiring and the hire or hire-purchase of apparatus.

The opportunity existed for speeding-up progress. The supply authorities might exercise a little more energy in laying distributing mains, the manufacturers must be prepared to increase the number of available appliances, while the contractors must set their minds to increasing the number of installations. By these means the more rapid electrification of the country's homes and industries could be brought about for the national good.

Contractors Not Satisfied

Mr. Rawlings responded and welcomed Mr. Pybus as "our political chief." He claimed that the contractors were among those responsible for laying the foundations of the electrical industry and the E.C.A. was the oldest trade organisation within the industry.

The contractor was a pioneer in home lighting and industrial and rural electrification; he had no hesitation in saying that at least 80 per cent. of existing connections had been sought for and put in by electrical contractors.

Contractors were not satisfied with the existing situation; the best was not being done for electrical development. The time was more than ripe for a comprehensive standardisation and simplification of electrical installation rules, methods and materials and, moreover, charges for electricity must be put on a uniform basis.

What was needed was a simple national code and a standard installation, provided with plenty of convenient outlets, that would be acceptable all over the country. Also, for the protection of the public it was necessary to institute the compulsory registration of electrical contractors. The manufacturers would welcome standardisation; Mr. Rawlings instanced the great simplification introduced by the lamp makers. Only by these means could the general public be given the full advantages of electrical service.

A Farthing Per Unit

The industry should aim at a 24-hour load with an unmetered supply, charged for quarterly or annually, and governed by a limiter. He had been informed that such a supply could be given at less than ¼d. per unit, or from £7 to £8 per kW per annum. Before this, however, adequate installations must be provided with outlets all over the house. Although he had the greatest respect for the I.E.E. Regulations, he thought they were too elaborate for such installations. We had to get down to brass tacks and by automatic limitation teach the consumer to use his installation in a sensible manner. They should bear in mind the possibilities of the old "tree" system, the independently fused outlet and the concentric earth return method.

The Guests

Proposing the health of the guests, Mr. A. G. Bruty, who disclaimed Irish nationality though he came from Dublin, said that the original electrical contractors' association was formed in that city thirty-five years ago. He and his Irish colleagues looked with envy upon the evident tendency towards co-operation in the English electrical industry.

The speaker thought that they should be gratified that such good sense had been exercised as to appoint an electrical man Minister of Transport. He referred to the presence of Col. Sir T. F. Purves, the Engineer-in-Chief of the G.P.O., to Sir John Brooke, vice-chairman of the Electricity Commission, and Messrs. A. H. Dykes, F. W. Purse and P. V. Hunter, who had done so much in connection with the National Register. There were also present the Vice-President of the Royal Institution of British Architects (Mr. S. Tatchell) and Mr. Allen West, Chairman of the E.T.B.I. Mentioning Miss Haslett's presence, Mr. Bruty said that he would like to see the E.A.W. movement spread to the Irish Free State.

Capt. J. M. Donaldson, President I.E.E., and Sir Thomas Purves, replied in an anecdotal manner which was much appreciated.

The chairman's health was toasted by Mr. F. H. Starling and Mr. Rawlings made a brief reply.

Music and vocal items were provided for the delectation of the company.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Foreign Factories in England

The Berlin correspondent of *The Times* states that public attention is being drawn there to an advertising campaign which has been started by British municipalities, district councils, and estate companies with the object of inducing German manufacturers to open works in the districts in which the advertisers are interested. It is stated that many British firms, finding themselves unable to deliver British substitutes for goods excluded under the Abnormal Importations Act, have been making urgent appeals to German manufacturers to provide them with special machinery and expert workmen on unusually generous terms. German firms are therefore tempted to erect factories of their own, and several have already purchased sites for them. As any large emigration of German industry will, it is argued, be contrary to the national interest, the Government and local authorities are enjoined to lighten the burdens which handicap German manufacturers at home.

British Interests in Argentina

According to *The Times* a deputation representing the principal financial and commercial interests directly connected with Argentina was received by the Rt. Hon. Walter Runciman, President of the Board of Trade recently. The deputation, which included the Duke of Atholl (chairman of the Anglo-Argentine Tramways Co.) and Mr. J. C. Denison-Pender (chairman of the Western & Associated Telegraph Companies), expressed its considered view that Argentina offered as a whole one of the most valuable and expanding markets for the sale of finished industrial products in which this country specialised. It suggested that after provision had been made for Imperial requirements, special treatment should be accorded to encourage Anglo-Argentine trade. The deputation said that it had little doubt that a plan under which Argentina could continue to find a market in this country would receive reciprocal advantages from the Argentine Government.

Melbourne Wireless Exhibition

The Victoria Radio Association has decided to organise another wireless exhibition similar to that held last May. It will be held in the Melbourne Town Hall from April 7th to April 15th.

A Bank-lighting Installation

A novel and effective form of illumination has recently been installed at one of London's banks. The lighting fittings are beehive shaped and were designed and manufactured by

Siemens fittings in a bank

Siemens Electric Lamps and Supplies, Ltd. They are also fitted with Siemens gas-filled lamps. As will be seen from the accompanying illustration, these fittings are of pleasing appearance and provide shadowless illumination without glare.

French Import Restrictions

As a temporary and exceptional measure the French Government has issued a decree which places restrictions on imports between January 20th and March 30th of certain kinds of electrical machinery, plant and accessories. Certain French works have had to be stopped owing to the diminution in orders, which varies between 30 and 75 per cent., according to the manufacturers concerned, in relation to the position in 1930. In the case of the other works the length of the working week has been reduced and is now less than 40 hours, despite a reduction of 20 per cent. in the number employed. Previous to bringing the decree into force discussions took place between the French industry and Germany, which led to an agreement which was signed on January 11th by representatives of the French and German electrical industries. The decree applies to motors, dynamos, transformers, switching apparatus, electric heating apparatus, vacuum cleaners, insulating tubes, etc. The quotas fixed for each class of manufacture do not apply to deliveries by the Germans on account of reparations. Quotas are fixed for imports from Germany, Switzerland, Great Britain, Sweden, the United States and other countries. In the case of Germany the imports on the basis of the quota for that country will only be admitted when accompanied by a certificate of the Central Union of the German Electrotechnical Industry and countersigned by the French commercial attaché in Berlin. No individual import licence will be granted for goods emanating from countries other than Germany.

Lighting Trades' Manchester Showrooms

Electrical contractors and dealers in the Manchester area now have an increased range of equipment from which to make selections by the recent opening of a new electrical show-

A lighting fittings display at Manchester

room at 89, Shudehill, Manchester, by Lighting Trades, Ltd. and the Welsbach Light Co. As will be seen from the accompanying illustration, an attractive and extensive display of modern lighting fittings, comprising panel glass, decorated glass, silk shade pendants, brackets, table and floor standards has been arranged, the majority of the items being separately wired for lighting. This is a feature much appreciated by buyers, who are able to see the articles of interest to them displayed as they would appear in actual use. In addition to lighting fittings, considerable space is also devoted to glassware, silk shades, "Redot" fires and domestic appliances. The depôt of the company remains at 75, Spear Street.

New E.D.A. Offices for North-West Area

The Manchester office of the British Electrical Development Association has recently been transferred to new premises at Sunlight House, Quay Street. In addition to adequate office accommodation, E.D.A.'s new home contains a large conference room capable of seating fifty persons, where lectures and demonstrations will be held from time to time.

American Copper Exporters

Although progress is being made with the drawing up of the new rules under which the Copper Exporters' Association will operate, it is not expected that details of the new regulations will be worked out for several weeks. At present the Association, which is the single selling agency abroad for companies representing 90 per cent. of the total world copper production, is operating under temporary rules, and can continue in this fashion until the end of March, when it will enter upon the curtailment programme agreed upon at the beginning of the year. As the allowable output of the companies concerned will be changed by the January restriction plan, their quota of sales through the Association will also be changed. Thus it is imperative, according to traders, that the drafting of the new regulations should be completed by March 31st.—*Reuter's Trade Service* (New York).

The F.B.I. Trade Report

A forecast for the first quarter of the year contained in the "Business Barometer" of the Federation of British Industries says that there is little doubt that the abandonment of the Gold Standard by Great Britain marks a turning point in the world's economic history and that the "post-war" international gold standard has permanently broken down and cannot be restored in its previous form. All hope must be abandoned of finding an immediate way of escape from the excesses of production, misdirected investment, and Governmental extravagances of all kinds. While a modest general rise is not impossible, the trend of prices in 1932 is likely to be determined primarily by the independent facing of facts

by the separate nations. Heavy losses will have to be borne and drastic reorganisations undertaken, and in the process local inflations may raise local prices. War debts and reparations form a part only of this general salvage work. The preoccupation of the coming decade will be to rebuild on the national structures which survive, a system more in tune with the world's natural evolution and the temperaments of its peoples. So far as Great Britain is concerned, the new era is in process of being born. The nucleus of the new " sterling " group already exists. A comprehensive tariff system, coupled with arrangements for Empire co-operation and commercial agreements with selected countries would help to consolidate it. Provided that Britain frames her national policy wisely and her people are prepared both to continue to make sacrifices and face the future adventurously, there is no reason why the close of 1932 should not see British trade leading the way to recovery. This recovery, naturally, is bound to be slow and hesitating, but it should prove continuous.

British Factory Progress

The great progress made in methods of management in British factories is shown by the various papers and reports reprinted in a booklet on " Works and Factory Management " issued by the British Works Management Association. These prove how ill-founded are many of the criticisms made of Britain's industrial organisation. Copies of the booklet may be obtained post free from the Association's offices, 51, Palace St., S.W.1.

Commercial Electrical Travellers

The Electrical Trades' Commercial Travellers' Association is holding its annual dinner on February 26th, at the Connaught Rooms, W.C., at 6.30 for 7 p.m. Tickets (12s. 6d. each) can be obtained from the hon. secretary, 58, Canterbury Road, Harrow, Middlesex.

British Radio Valve Preference

British and Dutch radio valves are specifically excepted in an official decree which prohibits the importation of valves of German and American origin into France until April 1st, 1932. The importation of radio telegraph and telephone sets is prohibited until the same date.—*Reuter* (Paris).

Factories at Dundee

An excellently produced book has just been issued by the Dundee Development Committee entitled " Do it at Dundee." With the aid of numerous illustrations it demonstrates the splendid opportunities offered by Dundee for the development of industries, the sites and buildings available for manufacturing purposes, the city's power and transport facilities, etc.

An Australian Battery Company

United Batteries Proprietary, Ltd., is the title of a new company formed in Australia to acquire the business of battery manufacturers and distributors carried on at 163-5, Latrobe Street, Melbourne, under the style of United Battery Corporation. The capital is £5,000.

Social Event

Blackpool and Fylde Electrical Contractors' Association held a whist drive and dance on January 27th, Mr. G. R. Nelson (chairman), and Mr. A. E. Huddart (secretary), acting as M.Cs. About 150 members and guests attended.

Short Time in Austrian Works

Judging from reports from Vienna, the Austrian manufacturers of high-voltage apparatus, who have been short of work for some months, do not yet see any end to the depression. Foreign contracts, which were formerly the chief support of certain works, are becoming scarcer, partly because of the trade depression abroad and partly on account of foreign exchange restrictions. In addition, business on home account is almost at a standstill in the absence of either new construction or extension of existing industrial plant, and by reason of the complete stoppage of water-power development and railway electrification. Consequently, the leading firms have introduced short time and wage reductions. In general the number of work-people employed in this branch is only about a third of the 1927 figure.

Trade with Portuguese East Africa

A confidential memorandum on the appointment of agents and methods of trading with Lourenço Marques has been issued by the Department of Overseas Trade to firms whose names are entered on its Special Register. British firms wishing to obtain a copy should apply to the Department, 35, Old Queen Street, S.W.1, quoting reference number C.X. 3782.

The Swedish Engineering Industry

The review *Swedish Export*, states *Reuter's Trade Service* from Stockholm, has made an inquiry into the development of the Swedish engineering industry in 1931, and the replies received confirm the fact that the depreciation of the krona failed to bring the expected boom in export business, owing partly to the same currency development in several markets, including Great Britain, and partly to the numerous increases in import duties and other obstacles raised against Swedish exports. Exports of telephone and telegraph apparatus, according to Telefonaktiebolaget L. M. Ericsson, were rather good in spite of the crisis. The supply of orders has fallen but foreign orders are holding up better than those from the home market. The export business of the electrical industry fell by about one-third compared with 1930, but full compensation was afforded by the large orders for the electrification of the State railway line between Stockholm and Malmoe.

German Lamp Exports

It is announced from Berlin that the exports of glow lamps from Germany in 1931 amounted to 60,000,000 as compared with 82,000,000 in the preceding year, the values being 21,000,000 marks and 35,000,000 marks respectively. The present largest customer is said to be France, despite the decline in French imports from 8,400,000 lamps in 1930 to 7,000,000 last year, while British imports, which were 8,400,000 in 1930, fell to 6,500,000 in 1931, so that England now occupies second place as an importer of lamps from Germany. The exports to Poland have also dropped from 2,500,000 in 1930 to 1,000,000 last year.

Dutch Electrical Exports

According to the official statistics there was a large decrease in the exports from Holland of wireless apparatus and parts in December over November, and also as compared with December, 1930. For the whole of 1931 the exports amounted to 8,476 tons of the value of 48,559,000 fl., these figures comparing with 10,899 tons and 66,328,000 fl. in the previous year and 81,459,000 fl. in 1929.

In the case of incandescent lamps the December exports last year were considerably less in number and value than in the corresponding month in 1930. The total number declined from 49,450,000 of the value of 22,922,000 fl. in 1930 to 29,153,000 and 13,302,000 fl. last year, while the value of the exports in 1929 was 27,715,000 fl.

For Sale

Sunderland Corporation invites offers for the purchase of 1,500 d.c. meters.

Manchester Electricity Department invites tenders for the purchase and removal of motor generator sets.

(See our advertisement pages to-day.)

Recent Contracts

The Hain Steamship Co., Ltd., has ordered the latest type of Marconi direction finder to be fitted in fourteen of its ships, and the work of installation is proceeding as the ships come into port. These direction finding installations have a fixed aerial system comprising two loops about 3-ft. in diameter, mounted on a pedestal, 4 ft. high, the whole being bolted together and fixed to the deck in any convenient position. With these installations it is not necessary to have the aerial system installed immediately above the direction finding receiver as the connections from the fixed aerial system can be taken to the receiver up to a distance of 50 ft., if necessary. The only moving part of the equipment is the small search coil in the direction finding receiver.

The British Broadcasting Corporation has placed the contract for the transmitting equipment required for the new Empire broadcasting station at Daventry with Standard Telephones & Cables, Ltd. This company has exported from England some twelve similar short-wave equipments which are in use throughout the world as international radio-telephone links. It is expected that the equipment will be completed by the autumn, and will be installed and ready for testing by the end of the year. Some notes on the Empire system appear on page 190 of this issue.

Maintenance of Commutators

Allied Engineering Industries, Ltd., informs us that it is now manufacturing the goods required for the maintenance of commutators entirely in this country. Hitherto the commutator cements, slotting files, cleaners, etc., supplied by this company were made abroad.

The Paris International Trade Fair

During the Paris Trade Fair, which will be held from May 4th to 18th, a competition open to all kinds of new inventions will be held as in previous years. Prizes, amounting in all to 30,000 fr., will be awarded for the best exhibits, and there are special sections for inventions relating to electricity, wireless, heating, lighting, and household articles. If the invention is not yet protected, the exhibitor may apply to the Committee of the Fair for a *certificat de garantie* for the temporary protection of industrial property at exhibitions. Applications from those desirous of taking part in the competition (Concours d'Inventions) should reach the representative of the Fair, 143, Fleet Street, E.C.4, not later than March 1st.

Cable Manufacture in Belgium

An exceedingly depressed condition prevails in the electric cable industry in Belgium. Interviewed on the subject, the managing director of the Société des Câbles et Corderies du Hainaut, of Mons, reports that since 1924 there have been good orders for cables in connection with both electricity supply and telephone communication extensions in the country. At the present time, owing to the difficulty of obtaining the necessary financial credits, very few orders for either kind of cable are being placed. The Government is being urged to do what it can to keep up the flow of orders in order to prevent it becoming necessary to increase the difficulties of the situation by throwing a number of men out of employment.

Trade Announcements

The Manchester offices of the Vincent Switchgear Mfg. Co., Ltd., has been moved to 16, Blackfriars Street (telephone Blackfriars 7389).

In our issue of January 22nd the address of J. H. Heathman, Ltd., was incorrectly given. It should have been 10, Heathman's Yard, Parsons Green, S.W.6. (Telephone: Fulham 0150).

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

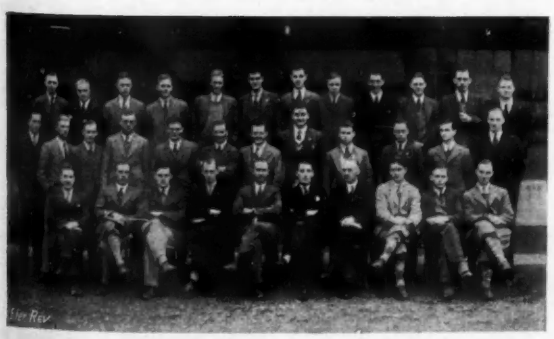
CHEMICALS, Etc.	Price Feb. 3rd.	Fortnight's Inc. or Dec.
a Acid, Oxalic .. .. per lb.	5½d.	—
a Ammoniac, Sal .. .. .. per ton	£60	—
a Ammonia, Muriate (large crystal) .. „	£52	—
a Borax .. .. „	£17	—
a Copper Sulphate .. .. .. „	£25 10s.	—
a Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a „ Perchlorate .. .. .. „	5½d.	—
a Shellac T.N. .. .. .. per cwt.	£4 5s.	—
a Sulphur Commercial .. .. .. „	£11	—
a „ Roll .. .. .. „	£11	—
a Soda, Chlorate .. .. per lb.	3d.	—
a „ Crystals .. .. .. per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks .. .. per lb.	4d.	—
METALS, Etc.		
b Aluminium, Ingots .. .. .. per ton	£95 to £100	—
b „ Wire .. .. .. per lb.	1/1 to 1/9	—
b „ Sheet and Foil .. .. „	1/1½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I .. .. .. per ton net	£134	—
Grade II .. .. „	£95	—
Grade III .. .. „	£55	£1 inc.
c Brass (rolled metal 2" to 12" basis) .. per lb.	7¾d.	¼d. dec.
c „ Tubes (solid drawn) .. .. „	9¼d. to 10d.	¼d. dec.
c „ Wire, basis .. .. .. „	8¼d.	¼d. dec.
c Copper Tubes (solid drawn) .. .. „	11d.	¼d. dec.
g „ Bars (best selected) .. .. per ton	£74	£3 dec.
g „ Sheet .. .. „	£74	
g „ Rod .. .. „	£74	
d „ (Electrolytic) Bars .. .. „	nom.	—
d „ „ Sheets .. .. „	nom.	—
d „ „ Wire Rods .. „	nom.	—
d „ „ H.C. Wire .. per lb.	7 1/16d.	1/16d. dec.
f Ebonite Rod .. .. „	1/3 to 1/6	—
f „ Sheet .. .. „	1/3 to 1/6	—
n German Silver Wire .. .. .. „	2/2	—
h Gutta-percha, fine .. .. .. „	4d.	¼d. dec.
h India-rubber, Para fine .. .. „	4¼d.	—
i Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
i „ Wire, galve. No. 1, P.O. qual. „	£20	—
g Lead, English pig .. .. .. „	£16	5s. dec.
g Mercury .. .. .. per bot.	£17 15s.	12s. 6d. dec.
e Mica (in original cases) small .. per lb.	6d. to 3/6	—
e „ „ medium .. „	4/- to 8/-	—
e „ „ large .. „	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings .. „	1/1½d.	—
p „ „ drawn bars & rods „	11½d.	—
p „ „ rolled strip & sheet „	1/-	—
p „ „ wire .. .. „	1/1½d.	—
o Platinum .. .. per oz.	£11 4s.	4s. inc.
d Silicium Bronze Wire .. .. .. per lb.	8½d.	½d. dec.
r Steel, magnet, in bars .. .. „	7½d.	—
g Tin, Block (English) .. .. .. per ton	£142 10s. to £144 10s.	—
n „ Wire, Nos. 1 to 16 .. .. per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Boiling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

South African Students' Works Visits

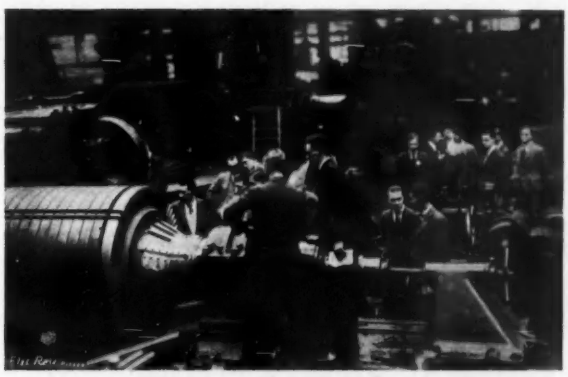
On January 20th a party of thirty students from the University of Witwatersrand under the leadership of Professor W. G. Sutton, the Dean of the Faculty of Engineering, visited the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. They were received on arrival by Mr. du Pasquier, the manager of the Publicity Department. The tour through the



The students at Trafford Park

works included visits to the insulation and winding department, the transformer department, the foundry and tank shop, the main machine shops, and the West Works in which high-voltage switchgear for various large undertakings was seen in course of construction. A visit was paid to the manufacturing departments and the Research Department and after viewing an induction furnace in operation the visitors made a general inspection of the laboratories.

The Rugby Works of the British Thomson-Houston Co., Ltd., were visited by the party on January 29th. The students were received by members of the B.T.-H. Overseas Association. A number of the departments were visited before lunch, when the party was joined by Mr. A. P. Young, works manager, Mr. E. G. Taylor, Mr. R. C. Plowman and Mr. E. H. Ball, of the company's export department, and Mr. T. Wadsworth, of the engineering laboratory. After lunch the



The visitors inspecting a turbine rotor at Rugby

visitors were conducted round the turbine, transformer and large electrical machine factories, "Mazda" lamp factory, fabricated construction department, engineering laboratory and acoustical department.

Above the students are seen inspecting a turbine rotor in the slot milling machine.

New Catalogues and Lists

English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—A leaflet relating to motors.

Yorkshire Electric Transformer Co., Ltd., Empire Works, Dewsbury.—A copiously-illustrated booklet showing various types of transformers and also a number of interesting installations where "Yorkshire" transformers are in use.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—Particulars of the "Metalix Junior" X-ray unit and accessories for use in conjunction with it.

British Electric Lamps, Ltd., Spencer Hill Road, Wimbledon, S.W.19.—A leaflet describing "Bell" gasfilled and vacuum lamps.

Allied Engineering Industries, Ltd., 4-12, Palmer Street, Westminster, S.W.1.—List No. E.21 on the maintenance of commutators.

Visco Engineering Co., Ltd., 162, Grosvenor Road, S.W.1.—Catalogue No. 321 dealing with filtration plant.

A. P. Lundberg & Sons, Ltd., 477-489, Liverpool Road, Holloway, N.7.—List No. S.30, illustrating and describing plug connectors, adaptors, and similar electrical accessories.

Frys (London), Ltd., 24/25, King Street, Minories, E.1.—A leaflet dealing with "Enox" light machine saw blades.

J. Shaw, Son & Greenhalgh, Ltd., 57, Victoria Street, S.W.1.—An illustrated folder on high-pressure valves and boiler mountings.

Callender's Cable & Construction Co., Ltd., 2, Surrey Street, Strand, W.C.2.—Pamphlet No. 118, dealing with joint box compounds.

Rustproofing, Ltd., 11, Thames Street, Sunbury-on-Thames.—A number of leaflets on some of the company's processes for rustproofing iron and steel.

J. Dyson & Co., Ltd., 5 and 7, Godwin Street, Bradford.—A folder announcing a reduction in the price of "Godwinex" bell-ringing transformers.

Power Equipment Co., Ltd., Kingsbury Works, Hendon, N.W.9.—A leaflet dealing with the "Rex" single-phase a.c. meter.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C.2.—Leaflet No. 1137 giving details of type P.T.R.1a portable picture equipment.

Gent & Co., Ltd., Faraday Works, Leicester.—Leaflet No. 162C on "Tangent" weatherproof bells.

Direct Electric Lamp Co., Ltd., 72, Shoe Lane, E.C.4.—A price list of electric lamps and accessories.

Simplex Conduits, Ltd., Garrison Lane, Birmingham.—A folder dealing with the new 15- and 30-A "Black Prince" switchgear.

Davies, Kent & Stewart, Ltd., 17, Berners Street, W.1.—Catalogue No. 37, illustrating and describing wall sockets, plugs, ceiling roses, flexible wires, and other accessories.

Walter Grafton & Son, Ltd., Eltham, S.E.9.—Leaflets on "Walligraph" extending arms for telephones and lamps, &c., and "Localite" adjustable lamp brackets.

Autoway Co., 13, Wellington Street, Glasgow.—An illustrated folder containing particulars of a new British-made hand dryer.

Blackstone & Co., Ltd., Stamford.—A 72-page catalogue on the company's "Spring Injection" oil engines.

British Insulated Cables, Ltd., Prescot, Lancs.—Leaflet No. P.266 relating to "Rockbestos" insulated magnet wire.

British Ropes, Ltd., 52, High Holborn, W.C.1.—A stoutly made wall calendar in the form of a section of cable. It has weekly slips.

Bankruptcy Proceedings

D. L. Gibson (trading as James Rush & Co.), radio dealer and manufacturer, 31-33, Westgate Road, Newcastle-upon-Tyne.—The public examination of this debtor was held on January 27th at the Court House, Newcastle-upon-Tyne. The statement of affairs showed liabilities of £4,240, and a deficiency of £3,286. The debtor stated that he was formerly in employment as a traveller in wireless goods, and in October last his employer informed him that owing to lack of capital the business must be closed. He offered to transfer the business to the debtor, however, without cash consideration if he could raise £500 as working capital. The debtor borrowed £500 from a relative and agreed to take over the liabilities of £2,605 and to employ the vendor as manager. The debtor admitted that during the time he was trading he lost £70 per week. The examination was adjourned.

A. J. Gridley (trading as A. J. Gridley & Co.), electrical contractor, 170, Stockwell Road, S.W.9.—The statutory first meeting of creditors was held on January 27th at Carey Street, W.C. A statement of affairs was submitted showing liabilities of £479 and assets of £99. The failure is attributed to general trade depression. The debtor's affairs have been left in the hands of the Official Receiver.

C. G. Smith, electrical contractor, 66, Lichfield Street, Wolverhampton, Staffs.—The first meeting of creditors was held recently at the Official Receiver's office, 191, Corporation Street, Birmingham. No statement of affairs was submitted, and Mr. A. E. Lacon was appointed trustee.

H. H. Bucklar, electrical contractor, 3, The Arcade, Hitchin.—Receiving order made January 21st on debtor's own petition. First meeting February 4th at the Chamber of Commerce Room, Luton. Public examination February 19th at the Court House, Luton.

S. L. Holt, electrical and radio engineer, 46, Highland Terrace, Uffculme, Devonshire.—First meeting February 2nd at the Official Receiver's offices, Exeter Bank Chambers, Broadgate, Exeter. Public examination February 18th at the Castle, Exeter.

R. J. C. E. Lovelock, electrician, 36, Sirdar Road, Portswood, Southampton.—First meeting February 4th at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton.—Public examination February 17th at the Court House, Castle Square, Southampton.

C. H. Lawson, electrical contractor, 1079, Chester Road, Stretford, Manchester.—Last day for receiving proofs for dividend February 13th. Trustee, Mr. F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver.

Company Liquidations

Universal Electro-Acoustic Products, Ltd., Fanny Street, Cardiff.—The statutory first meeting of creditors was held recently at 34, Park Place, Cardiff. The failure was attributed to "the inability of the company, consequent upon lack of capital, to meet liabilities for large stocks purchased in anticipation of business which did not mature." According to a statement of affairs submitted there were liabilities of £463, and a deficiency of £231. As regarded contributories, the unsecured liabilities were £697, which gave a total deficiency of £928. The matter was left in the hands of a liquidator and a committee of inspection.

E. Lawson, Ltd.—Winding up voluntarily. Liquidator, Mr. C. R. Branson, 16, Regent Street, Barnsley.

Dissolutions of Partnership

Beedham & Catterall, wireless and electrical engineers, 24, Aldermanbury, Bradford.—Mr. T. Catterall and Mr. G. E. Beedham have dissolved partnership. Mr. Catterall will attend to debts.

Bexley Heath Electrical Co., electricians and electrical engineers, 191, Broadway, Bexley Heath, and 3, Station Parade, Erith.—Messrs. A. E. Quinton and S. Edwards have dissolved partnership. Mr. Quinton will continue the business.

Private Arrangements

Courtin & Walsh, Ltd., electrical suppliers, 15, Westmorland Place, London, N.1.—An informal meeting of creditors was held at the Southern Hotel, Cannon Street, E.C., on January 27th, when the chair was occupied by Mr. R. F. Woodburn, the receiver for the debenture holder. Figures submitted showed that the trade liabilities amounted to £774, in addition to the debenture of £900 plus interest of £84. The total assets were between £700 and £800. The chairman said that the whole of the troubles of the company had arisen during the past year, and were in consequence of the greatly decreased turnover of the business. If any suggestions could be made with a view to increasing the turnover of the business he would be prepared to ask them to extend a moratorium to the directors for at least six months. The matter was briefly discussed, and no suggestions being forthcoming from creditors, the chairman stated that he had no other alternative therefore but to realise the assets for the benefit of the debenture holder, after a few days' delay. The following are the principal creditors:—

	£		£
Arthurs	57	Magna Wire & Cable Co.	39
General Accessories Co. ...	62	Spencer, J. E. & S. ...	53
Heath, S.	28	Venner Time Switches,	
Imperial Lighting Co. ...	38	Ltd.	46

E. E. Jones (trading as the Mersey Radio & Photographic Co.), wireless dealer, 19, Water Street, Liverpool.—A meeting of creditors was held on January 29th, at the offices of Mr. H. C. Binns, 81, Dale Street, Liverpool. The statement of affairs showed liabilities of £314, of which £190 was due to the trade, and the balance to cash creditors. The assets totalled £105, and, after allowing £25 for preferential claims, the net assets were £80, leaving a deficiency of £234. The cash creditors were relatives, who had agreed to withdraw the whole of their claims. The debtor attributed his position to lack of capital, bad trade, and keen competition. It was decided to confirm the deed of assignment already executed to Mr. Binns.

Meeting of Creditors

Quickfix Electrical Fittings Co. (1928), Ltd.—A meeting of creditors was to be held on Wednesday last in Glasgow to consider a resolution authorising the company to go into liquidation.

Electricity Supply

Lighting, Domestic, Power

Accrington.—SUPPLY TO HAMBLEDON MILL.—The Corporation has authorised the erection and installation of a transformer sub-station with switchgear and cables at Hambledon Mill.

Australia.—DEVELOPMENT OF NEW CENTRES.—The Victorian Legislative Council has passed a Bill which authorises the State Electricity Commission to spend £240,000 of loan money on the development of new centres. A sum of £130,000 is allocated for the "Yallourn B" power station, which when completed will have cost £2,000,000.

Barnstaple.—TARIFF ALTERATIONS.—The Town Council has made the following alterations in its charges for electricity:—Lighting, two-rate system: All consumers contracting to pay for not less than 500 kWh per quarter, 4 p.m. to 10 p.m., 8d. per kWh; 10 p.m. to 4 p.m., 4½d. Manufacturing industries: Light used in works only, 6d. per kWh. Ordinary consumers: 8d. per kWh. Power: First 200 kWh per quarter, 4d. per kWh; next 350 kWh, 3d.; next 450 kWh, 2d. Special contracts will be entered into with the consumers who guarantee a minimum consumption of 1,000 kWh per quarter at 2d. per kWh, and special terms will be granted to those guaranteeing a minimum of 2,000 kWh per quarter or over. Heating and cooking: 3d. per kWh.

GENERATING PLANT EXTENSIONS.—The Council has received consent to the extension of its generating plant by the installation of two 300-kW Diesel engine driven d.c. sets.

Barrow-in-Furness.—REQUEST FOR EXTENSIONS.—The Ulverston Rural District Council has asked the Corporation to consider the extension of the electricity supply from the village of Rampside to the coast road.

SUPPLIES TO FACTORY AND SANATORIUM.—The Electricity Committee has arranged to give a supply to the silk spinning factory of Messrs. Ellers, Ltd., at Ulverston at a cost of £752. The electricity supply to the High Carley sanatorium is also to be improved at a cost of £306.

LOANS.—Application is to be made for sanction to loans of £5,000 for sub-station switchgear and transformers, and £9,025 in connection with the acquisition of the Coniston undertaking and alterations and extensions to the plant.

Bath.—NEW SHOWROOMS.—The City Council has received sanction to a loan of £29,000 for the erection of new showrooms and offices for the Electricity Department.

Battle.—SUPPLY TO HOUSING ESTATES.—The Urban District Council has granted the Hastings Electricity Department permission to lay underground cables for the supply of electricity to houses on the Senlac Gardens Estate, and also at Netherfield, where a sub-station is to be provided. The Department has also asked whether the Council will allow connections to be made to the cable to the pumping station for supplying houses in Western Avenue.

Birmingham.—PROGRESS OF ELECTRICITY DEPARTMENT.—The Electric Supply Committee proposes to incur a further expenditure of £719,941 to meet its capital requirements until September 30th, 1933, in respect of the following items: General mains extensions, £500,000; sub-station buildings and plant, kiosks, e.h.p. switchgear, and transformers on consumers' premises, £200,000; additional expenditure on sub-station buildings in 1929-31, £10,941; additional land, etc., Ham's Hall, £9,000. The Committee points out that in January of last year the Council sanctioned the raising of £700,000 to meet the estimated capital requirements to March 31st, 1932, but that, so far as can be seen, this provision may fall somewhat short of the cash requirements up to the date mentioned, by reason of the abnormal increase in the number of premises coupled up recently. The extent to which the popularity of the use of electricity among the residents in the area of supply has grown in recent years is indicated in the following table.

Year ended March 31st.	Number of New Consumers Connected.	Additional Lamps Installed.	Additional Power, etc. Supplies Installed (kW.).	Total Number of Consumers.
1927..	10,307	124,777	15,005	47,408
1928..	9,753	112,761	21,261	57,161
1929..	11,076	132,040	25,366	68,237
1930..	11,792	109,342	23,797	80,029
1931..	18,933	203,187	33,631	98,962
9 months ended December, 1931	17,109	185,022	27,779	116,071

During December 1,514 additional consumers were connected, representing an aggregate of 19,700 lamps and 5,500 h.p. in power supplies. Sales of electrical energy during the December quarter were 12 per cent. higher than in the corresponding period of 1930, the improvement representing a greater use of electricity in consumers' works rather than an improvement in industrial conditions. The total sales for the quarter amounted to 108½ million kWh.

Bradford.—TWO MILLS TO USE ELECTRICITY.—Two large textile mills which are changing over from steam to electricity, and whose applications for supplies were accepted by the Electricity Committee last week, are expected to have a consumption yielding an extra £6,000 a year revenue to the Electricity Department.

Brighton.—TARIFF ALTERATIONS.—As a result of certain anomalies having arisen in the application of the two-part tariff to business premises, the Electricity Committee has decided to withdraw so much of the tariff approved by the Council in October last as relates to shops, business premises, and hotels taking more than ¾-kW maximum demand, and to substitute a simplified tariff on a two-part basis. In connection with the two-part tariff for private residences, the minimum assessment is to be fixed at £2 per annum, and all assessments are to be made to the nearest 2s. 6d. per annum.

Burnley.—PREPARATIONS FOR GRID SUPPLIES.—The Town Council has approved a proposal to borrow £10,500 to meet the Electricity Department's anticipated expenditure on new switchgear, cables, &c., required in connection with the supplementary supplies from the Central Electricity Board. The Electricity Committee has considered two alternative schemes and has approved a recommendation to replace the whole of the existing cellular gear with modern metalclad gear.

Cardiff.—CHANGE-OVER.—The Electricity Committee has decided to change over the system of supply in central area of the city at a cost of £15,500.

Chelmsford.—OVERHEAD LINES.—The Rural District Council has received notice from the County of London Electric Supply Co., Ltd., of its intention to erect medium-pressure overhead lines in the parishes of Little Baddow, Danbury, Ingatestone, and Fryerning and Woodham Ferrers. The Central Electricity Board has also informed the Council of its intention to apply to the Ministry of Transport for permission to erect overhead lines in the parishes of Great Baddow, Danbury, West Hanningfield, East Hanningfield, Sandon, and Woodham Ferrers.

Cheltenham.—ELECTRICITY FOR STAVERTON.—The Electricity Committee has arranged to provide a supply to Staverton at a cost of £2,000.

LOAN.—Sanction to a loan of £10,000 for mains and services is to be applied for.

Chester.—EXTENSIONS.—The Electricity Committee has decided to recommend the Council to apply for sanction to the borrowing of £20,000 for mains and services, and £5,000 for the erection of rural sub-stations.

PUBLIC LIGHTING.—The Watch Committee recommends that application should be made for sanction to a loan of £13,572 for the installation of the new system of public lighting in the main thoroughfares of the city.

ELECTRIC HEATING AT TOWN HALL.—The Town Hall Committee is considering schemes for heating several rooms in the Town Hall by electricity.

Croydon.—DE-AERATING PLANT.—The Electricity Committee proposes to incorporate a de-aerating plant in the evaporating equipment at the generating station at an estimated cost of £2,790.

Didcot.—OVERHEAD LINES INQUIRY.—Col. F. Gordon Tucker held a Ministry of Transport inquiry on January 26th with regard to the proposal of the Central Electricity Board to construct an overhead transmission line from Oxford to Reading. The proposal was opposed by Mr. F. A. Smith and Mr. C. C. Caudwell, who desired the Board to alter the route of the line at an additional cost of £197. Col. Tucker said that there was no *prima facie* justification for an additional outlay. The Abingdon Rural Council had no better suggestion to make.

Elgin.—ELECTRICITY PREFERRED.—Notwithstanding a protest by the convener of the Gas Committee the Town Council has decided to adhere to its decision to carry out a street lighting scheme by electricity instead of gas.

Fleetwood.—GRID SUPPLY.—Councillor C. Saer, chairman of the Electricity Committee, informed the Fleetwood Council at a recent meeting that the Central Electricity Board would supply the Council with electricity at the rate of £4 2s. per kW of maximum demand, plus 0.2d. (coal charge) per kWh supplied. This agreement would hold for six years, after which the Council would decide whether it would continue to pay for electricity on those terms or at the general grid price yet to be fixed.

RADIO SET CONVERSION.—It was also stated that it would not be possible for the Council when changing over apparatus to a.c. to meet the cost of the conversion of wireless sets, but it was intended to make reductions in the local electricity charges soon.

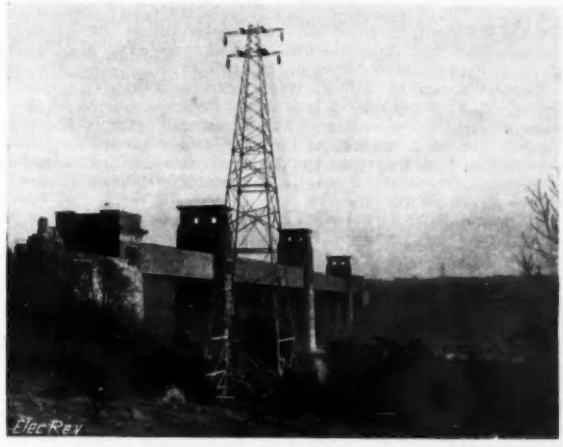
Ilford.—LOAN.—The Electricity Committee recommends application for sanction to a loan of £25,000 for mains and services.

India.—CALCUTTA.—During the twelve months ended December 31st last the Calcutta Electric Suppl yCorporation, Ltd., sold 177,752,000 kWh of electricity, an increase of 6,087,000 kWh, as compared with the preceding year.

Irish Free State.—CLONDALKIN (Co. DUBLIN).—The chairman of the Electricity Supply Board, Mr. R. F. Browne, recently received a deputation on the subject of providing electricity for the town. He gave an undertaking that the Board had definitely under consideration in a programme for the development of new areas the provision of a supply for Clondalkin.

Isle of Man.—THE ELECTRICITY BILL.—The *Manchester Guardian* states that, on the first reading of a Bill to set up a Manx Government Board to distribute a supply of electricity throughout the island, the Attorney-General said that at the present time the Governor of the island did not feel justified in encumbering the island's revenue with the charges a public electricity supply would involve. He suggested that they might pass a Bill with a proviso that it should not come into operation until the Tynwald deemed it prudent.

Lancaster.—NEW FEEDER.—The Town Council has decided to lay a new feeder cable from Caton Road generating station under the bed of the river to the Morecambe and Heysham boundary at a cost of £6,000. The existing cable will be used as a reserve.



[*Photopress*

One of the 125-ft. towers carrying the transmission line across the Menai Straits for the supply to Anglesey

London.—ST. MARYLEBONE.—The Electric Supply Committee recommends the inclusion of Miles' Buildings in the Council's scheme for wiring blocks of tenement properties. The estimated cost of the necessary wiring mains is £1,191.

BERMONDSEY.—The Electricity Committee recommends the acquisition of the Royal Oak Public House, Union Street, which will shortly be de-licensed, for conversion to electricity showrooms.

SUPPLY TO ROEHAMPTON ESTATE.—The L.C.C. Housing Committee is not prepared to recommend the Council to incur the expenditure for wiring the houses on the Roehampton Estate, but will raise no objections to the tenants making their own arrangements with the local electricity company.

Manchester. — WITHINGTON HOSPITAL INSTALLATION. — The Health Committee is to provide new mains and distribution boards at the Withington Hospital at a cost of £1,000. A bed lift is to be installed at the hospital at a cost of £600.

PUMPING PLANT.—The Rivers Committee is to install automatic electric pumping plant at the Davyhulme sewage works at a cost of £300.

Morecambe.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £400 to supply Heaton-with-Oxcliffe.

New Romney.—REQUEST FOR SUPPLIES.—The Town Council has communicated with the Electricity Commissioners, with the support of neighbouring authorities, pressing them to exert their influence to secure the extension of the supply of electricity in the district.

Nottingham.—COUNCIL'S RETRENCHMENT POLICY.—Recent excessive municipal expenditure in Nottingham has led to the necessity for severe retrenchment, the report of a Joint Committee which had had the matter under consideration recommending that projected expenditure upon schemes of public works, estimated to cost £418,000, should be deferred for twelve months. It is recommended that a proposed outlay of £22,500 on electricity supply extensions should be postponed and that the assisted wiring scheme should be slowed down.

Perthshire.—ELECTRICAL DEVELOPMENTS.—The ratepayers of Gartmore have decided to form a lighting district there, and Aberfoyle is considering taking similar steps. The Grampian Electricity Supply Co.'s transmission lines are now in course of erection in these districts.

Portland.—LOANS.—The Urban District Council has received sanction to loans of £7,047 for mains and services, £2,588 for sub-station plant and equipment, £543 for meters, £500 for assisted wiring, and £500 for domestic apparatus. A loan applied for in respect of overhead lines for Southwell and Moorfield has been deferred until the consent of the Ministry of Transport for the construction of the lines has been obtained.

Scarborough.—LOANS.—The Town Council is to apply for sanction to loans of £40,000 for mains and services and £10,000 for apparatus for hire.

Sedbergh.—INQUIRY.—Mr. H. Nimmo, the chief engineering inspector of the Electricity Commission, held an inquiry at Sedbergh on January 21st into the application of Messrs. Thos. Wilkinson (Arnside), Ltd., and Mr. J. A. Martin (trad-

ing as the Sedbergh Electric Supply Co.) for a Special Order for powers to supply electricity in Sedbergh Parish.

South Shields.—AGREEMENT WITH C.E.B.—An agreement has been reached between the Electricity Committee and the Central Electricity Board upon the proposals of the latter to take over the electricity station in West Holborn.

ELECTRIFICATION OF BOLDON COLLIERY.—The Harton Coal Co. has under consideration a scheme for the electrification of Boldon Colliery.

Startforth (Yorkshire).—ELECTRICITY SUPPLY SCHEME.—The Cleveland and Durham Electric Power Co. has submitted plans to the Rural District Council for supplying electricity to the villages of Mickleton, Romaldkirk, Cotherstone, and Lartington by means of overhead lines. The Council has decided to ask the company to place the lines underground through the villages, and the parish councils concerned have also been asked to express their views on the matter.

Tamworth.—OFFER TO PURCHASE UNDERTAKING.—At a meeting of the Town Council last week it was reported that a letter had been received from the Tamworth District Electric Supply Co., Ltd., containing an offer for the purchase of the Corporation's electricity undertaking. It was decided to invite representatives of the company to meet the Electricity Committee to discuss the matter.

Thames Valley.—REVISION OF CHARGES.—A special meeting of the Local Joint Advisory Committee for the Thames Valley Distribution Area was held recently for the purpose of considering proposals for the revision and unification of charges for electricity supplies in the area.

Todmorden.—APPARATUS FOR HIRE-PURCHASE.—The Electricity Committee has obtained sanction to a loan of £3,000 for domestic appliances for hire-purchase.

Tynemouth.—SUPPLY TO MOOR PARK HOSPITAL.—The Health Committee recommends the provision of electric wiring and additional equipment at the Moor Park Hospital at a cost of £825.

York.—LOAN.—The Electricity Committee is to apply for sanction to the borrowing of £25,000 for mains and services.

Traction

Australia.—HOBART (TAS.).—There was a decrease from £128,659 to £119,613 in the revenue from the tramways for the year ended June 30th last, the net deficiency increasing from £1,880 to £3,860. The number of passengers carried was 11,800,598.

Bacup.—TRAMWAY ABANDONMENT.—The Town Council has approved an agreement for the abandonment of the tramway service between Bacup and Rawtenstall and the substitution of buses. It is proposed to discontinue the tramway service on March 31st.

Bolton.—TRAMWAY ABANDONMENT.—Having considered the condition of Brownlow Fold tramway track, the Tramways Committee has decided to discontinue the service and substitute buses.

Brighton.—AUTOMATIC TRAFFIC CONTROL.—The Town Council has decided to have automatic light signals for road traffic installed at twelve points in the borough.

Burnley.—SATISFACTORY TRAMWAY RESULTS.—The estimates of the Corporation transport undertaking for the nine months ended December 31st show that economies have resulted in the Tramways Department showing a profit of £3,069, although receipts are down by £8,298. The buses, however, disclose a loss of £6,262, against a loss last year of £5,486. The North Western Traffic Commissioners recently congratulated the Burnley manager on the economical working of his Department.

Finchley.—EXTENSION OF TRAMWAY DEPOT.—The Metropolitan Electric Tramways, Ltd., is to extend the Finchley depôt at a cost of £25,000.

Ilford.—NEW TRAMCARS.—The Tramways Committee recommends the purchase of eight tramcars at an estimated cost of £17,250.

Lytham St. Anne's.—RECONSTRUCTION OF TRAMWAYS.—The Town Council has received sanction to a loan of £10,822 for the reconstruction of tramways in Squires Gate Lane.

Middlesex.—SPECIAL ORDER.—The Minister of Transport has recently made an Order entitled the "County of Middlesex Light Railways (Extension) Order, 1932," which authorises the construction of light railways in the urban district of Tottenham.

Newcastle-upon-Tyne.—THE OSBORNE ROAD ROUTE.—The Transport and Electricity Committee is to hold a private meeting to discuss afresh the Osborne Road tramway service. The Committee some time ago recommended the City Council to substitute a bus service on the route for the trams, but this was defeated, and the Council decided to relay the track in order that the trams could continue for a further period. It was afterwards discovered that the Council had failed to authorise the town clerk to apply for sanction to borrow the money for the new track, and that there was a distinct possibility that, in view of the Royal Commission's attitude to tramways, the Minister of Transport would refuse to sanction further expenditure on the track.

Smethwick.—TRAFFIC SIGNALS.—The Watch Committee has authorised the borough engineer to proceed with the provision of traffic control signals at road junctions.

Sunderland.—TRAMWAY ESTIMATES.—The Town Council's tramway undertaking is estimated to show a profit of £14,644 for the year ending March 31st next, as compared with £14,654 last year. Revenue is expected to amount to £116,000, as compared with an actual revenue last year of £120,110.

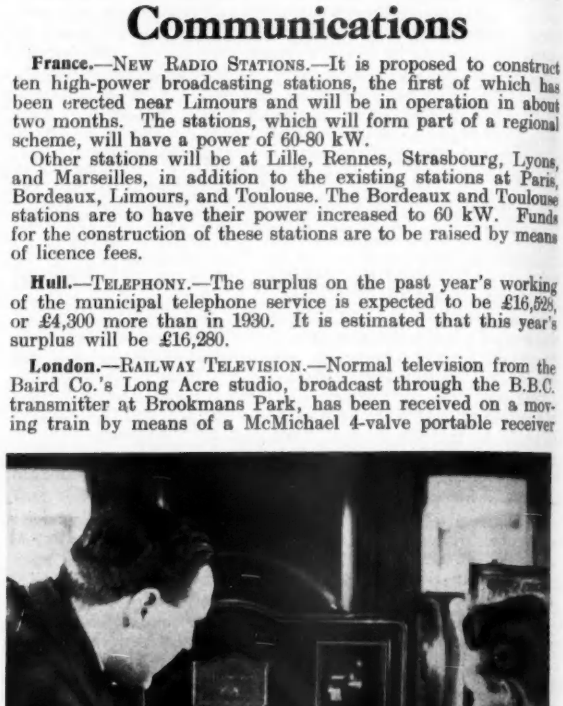
Communications

France.—NEW RADIO STATIONS.—It is proposed to construct ten high-power broadcasting stations, the first of which has been erected near Limours and will be in operation in about two months. The stations, which will form part of a regional scheme, will have a power of 60-80 kW.

Other stations will be at Lille, Rennes, Strasbourg, Lyons, and Marseilles, in addition to the existing stations at Paris, Bordeaux, Limours, and Toulouse. The Bordeaux and Toulouse stations are to have their power increased to 60 kW. Funds for the construction of these stations are to be raised by means of licence fees.

Hull.—TELEPHONY.—The surplus on the past year's working of the municipal telephone service is expected to be £16,528, or £4,300 more than in 1930. It is estimated that this year's surplus will be £16,280.

London.—RAILWAY TELEVISION.—Normal television from the Baird Co.'s Long Acre studio, broadcast through the B.B.C. transmitter at Brookmans Park, has been received on a moving train by means of a McMichael 4-valve portable receiver



[Topical Press

Television on an express train

coupled to a "Televisor." The train reached a speed of 70 m.p.h. and the image could still be seen. The tests were conducted to ascertain whether vision as well as sound reception would be possible on a fast-moving train. The L.N.E.R. has already equipped one of its regular express trains with a wireless receiver and headphones, which passengers hire.

Manchester.—TELEPHONE PROGRESS.—The annual report of the local Postal, Telegraph, and Telephone Advisory Committee shows that in 1931 in this district (superintending engineer: Mr. T. E. Herbert) the number of telephones increased to 97,069, a growth of 2.25 per cent. The number fitted was 11,632, and the cessations 9,494. During the year effective trunk calls and telegrams totalled 6,526,263, a decrease of 321,756, which is in all probability due to the existing trade depression. Local calls for the twelve months show that approximately 71,250,000 calls were originated, or an increase of about 540,000. An analysis of trunk traffic reveals the incidence of Manchester traffic as between morning, afternoon, and night periods to be in the ratio of 55.7, 38.8, and 5.5 respectively.

It is now possible for a subscriber on any director auto-exchange in Manchester to dial direct through six automatic and 14 manual exchanges; in 1932 some 12 exchanges are to be converted, which work is necessitating a considerable amount of new underground cabling. Some 110 street kiosks have been opened, as compared with 73 in 1930; and 23 public call offices were opened in post offices and railway stations.

Plymouth.—RADIO EXCHANGE.—The Corporation Works Committee has had applications from a number of firms for permission to install a system of re-diffusion of wireless programmes direct to consumers' houses by means of wires. The Committee has given its approval to the principle of the system, and has decided that the firms should be invited to submit their offers.

Spain.—TELEPHONE PROGRESS.—The Spanish Telephone Company, an associate of the International Telephone and Telegraph Corporation, recorded a net increase during 1931 of 28,000 telephones, an increase of approximately 13 per cent. over the 1930 figure. In addition, orders for 5,000 more telephones are pending installation. On December 31st, two exchanges were cut over from manual to automatic operation. These exchanges serve Sabadell and Tarrassa, two industrial cities in Catalonia with large textile industries.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—February 25th. Electric pumping sets with switchboard, &c., for La Plata. (G.X. 11126.)*

Australia.—BARRON FALLS HYDRO-ELECTRIC BOARD.—March 28th. Hydro-electric station 20 miles from Cairns. (A.X. 11247.)*

Belgium.—ANDERLECHT.—February 10th. Régie de l'Electricité, Hotel Communale, Anderlecht. H.p. and l.p. armoured cable. Particulars (Cahiers des Charges) for 3 fr. each from 4, Rue Van Lint.

BRUSSELS.—February 24th. Régie des Télégraphes et Téléphones, Salle de la Madeleine, Brussels. Supply and laying of telephone cables in the Bruges, Alost and Ghent districts. Particulars (Cahier des Charges Spécial No. 3-610) for 6.80 fr.

Blackburn.—February 29th. Electricity Department. Insulated cable and wire and meters. (January 22nd.)

Bracebridge (LINCOLN).—February 10th. Mental Hospital Committee. Electrical installation at Mental Hospital. (See this issue.)

Carlisle.—February 23rd.—Installation of lighting and heating at Longtown Isolation Hospital. Particulars from the city electrical engineer.

Dewsbury.—February 6th. Town Council. Wiring 20 houses, Field Lane, Ravensthorpe. Particulars from the borough electrical engineer.

Dundee.—February 10th. Electricity Department. E.h.p. and l.p. cable. (January 29th.)

Edinburgh.—February 6th. Corporation. Installation of electric lighting and power in the north-west wing, City Chambers. Specifications, &c., from the Engineer's Office, Dewar Place (deposit £1 1s.).

Farnham.—February 18th. Urban District Council. Two horizontal electrically driven boosting pumps, &c. Particulars (deposit £5) from Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.1.

Gainsborough.—February 10th. Electricity Department. L.p. cables, meter boards, and joint box compound. (January 29th.)

Hamilton.—Electricity Department. 1,000-kW rotary convertor. (See this issue.)

Harrogate.—February 17th. Twelve months' supplies of electric lamps. Particulars from Mr. C. E. Rivers, Municipal Offices.

Hastings.—February 9th. Electricity Department. General stores. (January 22nd.)

Hazel Grove and Bramhall.—February 8th. Urban District Council. Meters. (January 29th.)

Hitchin.—February 8th. Urban District Council. Electrical installation at 146 houses and 20 flats at the Woolgrove Housing Estate, Walsworth. Particulars from Mr. A. T. Blood, Council's surveyor, Old Town Hall (deposit £1 1s.).

Hull.—February 15th. Electricity Department. Static transformers and electric lamp posts and brackets. (January 29th.)

India.—February 23rd. Bengal and North-Western Railway Co., Ltd. 27,400 electric lamps. (See this issue.)

Kettering.—February 22nd. Electricity Department. E.h.p. and l.p. underground cables. (See this issue.)

Leeds.—February 16th. Electricity Department. General stores. (January 29th.)

Lithuania.—KOVNO.—February 24th. Administration of Posts, Telegraphs and Telephones. Bronze wire, galvanised iron wire, steel wire cable, telephone cable, submarine cable, cross arms, lead distribution sleeves, coupling sleeves, copper and aluminium sleeves. (A.11253.)*

Llandrindod Wells.—February 22nd. Urban District Council. Electrically driven pumping plant. Specifications, &c., from Messrs. Fiddian & Deeley, 13, Church Street, Stourbridge (deposit £2 2s.).

London.—CENTRAL ELECTRICITY BOARD.—February 15th. Central indication and telephone equipment and supervisory control equipment in the North-West England and North Wales area. (December 18th.)

February 29th. 33-kV overhead transmission lines for South Scotland Electricity Scheme. (January 29th.)

FULHAM.—March 7th. Borough Council. Generating station extensions. (January 29th.)

ISLINGTON.—February 19th. Borough Council. Street lamp columns with bases and fittings. (January 22nd.)

HAMMERSMITH.—February 24th. Borough Council. General stores, including electrical requisites. (January 29th.)

Manchester.—February 9th. Transport Committee. Permanent way points, tongues and crossings, and general stores. Schedules from the general manager, Corporation Transport Dept., 55, Piccadilly, Manchester.

February 8th. 6,600-V metal-clad bus section switchgear units. (January 29th.)

February 24th. Electricity Committee. Boiler and boiler-house vacuum cleaning plant. (See this issue.)

Middlesbrough.—February 8th. Sanitary Committee. Electrical installation at the Central Baths, Cilkes Street. Specifications from Mr. S. E. Burgess, borough engineer and surveyor, Municipal Buildings.

Northern Ireland.—ARMAGH.—February 13th. County Education Committee. Installation of electric lighting at Lurgan Model School. Particulars from Mr. J. St. J. Phillips, 16, Donegall Square South, Belfast (deposit £2 2s.).

Oldham.—February 9th. Gas Works Committee. Electric wiring of power plant at the Higginshaw gasworks. (January 29th.)

Penzance.—February 11th. Installation of electric lighting in the Wesleyan Church and surrounding premises at Chapel Street. Specification, &c., from Mr. F. W. Holman, 100, Market Jew Street.

Plymouth.—February 15th. Corporation. Meters, time switches, underground cable, transformers and e.h.p. and l.p. switchgear. (January 22nd.)

Portsmouth.—February 16th. Corporation. Electrically driven pumping plant. Specifications, &c., from the city engineer, Guildhall (deposit £2 2s.).

Rothwell (WEST RIDING).—February 22nd. County Council. Electric lighting installation at new Grammar School. Specifications from the education officer, County Hall, Wakefield.

Salford.—February 15th. Transport Department. Twelve months' supply of stores. Forms of tender from the general manager, Frederick Road.

South Africa.—DURBAN.—March 18th. Corporation. Tramway rails, &c. Specifications from Webster Steel & Co., 9, St. Helen's Place, E.C.3.

Swansea.—February 17th. Electricity Department. General stores. (January 29th.)

West Midlands.—February 10th. Joint Electricity Authority. 11,000-V overhead lines on wood poles. (January 22nd.)

Wolverhampton.—February 15th. Electricity Department. E.h.p. metal-clad switchgear. (January 22nd.)

February 17th. Corporation. Electrically driven centrifugal pump. Particulars (deposit £1) from Messrs. Dodd & Watson, Wellington House, Bennett's Hill, Birmingham.

---

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Accepted. L.p. lines for Lakeside and Haverthwaite.—Johnson & Phillips, Ltd.

Birkenhead.—Electricity Committee. Accepted. L.p. switch units (£309).—Ferguson, Pailin, Ltd. E.h.p. feeder units (£588).—A. Reyrolle & Co., Ltd. Two 400-kVA transformers (£298).—Brush Electrical Engineering Co., Ltd. Two 200-kVA transformers (£170) and two 100-kVA transformers (£127).—Metropolitan-Vickers.

Chester.—Electricity Committee. Accepted. Battery repairs at New Crane Street (£350).—Tudor Accumulator Co., Ltd.

Eastbourne.—Electricity Committee. Recommended. Cable for 12 months.—Craigpark Cable Co., Ltd.

Eccles.—Watch Committee. Accepted. Electrical installation at fire station (£185).—Charles Walton & Co.

Fife.—County Council. Accepted. Electric lighting installation at East Wemyss housing scheme.—J. B. Beveridge.

Halifax.—Tramways Department. Accepted. Electrical work at Elm Wood motor-bus garage (£293).—H. E. D., Ltd.

Hull.—Telephones Committee. Accepted. Four tons bronze wire (£296).—T. Bolton & Sons. 200 automatic table telephones (£526).—Automatic Telephone Manufacturing Co., Ltd.

Llandudno.—Electricity Committee. Accepted. H.p. and l.p. cable, sub-station kiosks, feeder pillars, and other equipment required for change-over in Craigydon district.—Henley's. Transformers.—Bruce, Peebles & Co.

London.—Metropolitan Water Board. Recommended. Electrically driven pump for Hampton Works (£66).—Harland Engineering Co., Ltd.

L.C.C. Stores and Contracts Committee. Accepted. Electrical insulating materials for one year.—L. Andrew & Co.; Attwater & Sons; M. Bond & Co.; British Central Electrical Co.; Dacier, Ltd.; Hooper's Telegraph & India Rubber Works; Hunter, Son & Co.; Ioco Rubber & Waterproofing Co.; Micanite & Insulators Co.; Pomona Rubber Co.; Rotunda, Ltd.; Rykneld Mills Co.; L. Vandervelde.

BERMONDSEY.—Electricity Committee. Accepted. Oil switch and meter (£1,258).—A. Reyrolle & Co., Ltd.

Oswaldtwistle.—Town Council. Accepted. Electric searchlight for the use of the fire brigade.—T. Francis & Sons.

Sheffield.—Tramways Committee. Accepted. 500 tons of manganese steel tram rails, 500 tons of chromium steel tram rails, and 300 pairs of fishplates.—Cargo Fleet Iron Co., Ltd. 1,550 copper bonds.—T. Bolton & Sons, Ltd. 180 pairs fishplates and 1,000 sole plates.—Coghlan Steel & Iron Co., Ltd. 1,110 pairs fishplates.—English Steel Corporation, Ltd. Three tons fish bolts, nuts and washers.—G. Cooper & Sons. 20,000 anchor bolts, nuts and plates.—Ibbotson Bros. & Co., Ltd. Double junction renewals.—Edgar Allen & Co., Ltd. Double junction renewals and 50 car wheel centres.—Hadfields, Ltd.

Shipley.—Offices Committee. Accepted. Installation of lift at public offices (£480).—Keighley Electrical Engineering Co., Ltd. Electrical installation.—Gordon Binns.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

MONMOUTH electric egg incubator.
British makers of electric sausage machines.
Hand-driven magneto generators.
Sweet cutting and moulding plant.

Forthcoming Events

Physical Society.—Friday, February 5th. Imperial College of Science, South Kensington, S.W. 5 p.m. Short papers.

Electrical Association for Women.—Monday, February 8th. E.L.M.A. Lighting Service Bureau, London. 7 p.m. "Lumens at Law." In aid of the funds of the E.T.B.I.

Illuminating Engineering Society.—Tuesday, February 9th. Trocadero Restaurant, W. 7.30 p.m. Annual dinner and dance.

Royal Institution.—Tuesday, February 9th. Institution, London. 5.15 p.m. "Recent Work on Crystal Analysis." Mr. G. Shearer.

Television Society.—Wednesday, February 10th. University College, Gower Street, W.C. 7 p.m. "Difficulties Encountered in Transmitting Pictures over Telephone Circuits." Mr. E. S. Ritter.

Edinburgh Electrical Society.—Wednesday, February 10th. Y.M.C.A., South St. Andrew Street, Edinburgh. 8 p.m. "Talking Pictures." Mr. V. M. Roberts.

Institution of Heating and Ventilating Engineers.—Wednesday, February 10th. Hotel Russell, London. 2.30 p.m. "Control of Heating Systems." Mr. L. J. Fowler. 7 p.m. Dinner.

Institution of Electrical Engineers.—Thursday, February 11th. Institution, London. 6 p.m. "Electrically Driven Underground Conveyors in Coal Mines and their Economic Advantages." Messrs. W. B. Hird and J. B. Mavor. (*Meter and Instrument Section*).—Friday, February 5th. Institution, London. 7 p.m. "Recent Developments in Cathode-Ray Oscillographs." Dr. A. B. Wood. "Accuracy of Measurements Made with Hot Filament Cathode-Ray Tubes." Prof. J. T. MacGregor-Morris and Mr. H. Wright. (*North-Eastern Centre*).—Monday, February 8th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Electrically Driven Underground Conveyors in Coal Mines, and their Economic Advantages." Messrs. W. B. Hird and J. B. Mavor. (*Western Centre*).—Monday, February 8th. Town Hall, Cheltenham. 6 p.m. "Electrical Measurement in Industry." Mr. F. C. Knowles. (*North-Western Centre*).—Tuesday, February 9th. College of Technology, Manchester. 7.30 p.m. Faraday lecture. "Everyday Uses of Electricity." Prof. J. K. Catterson-Smith. (*Scottish Centre*).—Tuesday, February 9th. Institution of Engineers and Shipbuilders in Scotland, Glasgow. 7.30 p.m. Joint meeting with I.E.S.S. "Modern Methods of Electric Lamp Manufacturers." Mr. L. E. Buckell. (*Hampshire Sub-Centre*).—Wednesday, February 10th. Kimbell's Café, Southsea. Conversazione. (*South Midland Students' Section*).—Wednesday, February 10th. Rugby. Joint meeting with Rugby Engineering Society. "Recent Developments in Porcelain Insulators." Mr. G. H. Halton. (*North Midland Centre*).—Thursday, February 11th. Hotel Metropole, Leeds. 7.30 p.m. Joint meeting with the Institution of Mechanical Engineers. Thomas Hawksley lecture. "The Mechanical Aspects of Electricity." Mr. Ll. B. Atkinson. (*Dundee Sub-Centre*).—Thursday, February 11th. University College, Dundee. 7.30 p.m. "The Control of Artificial Light by Means of the Glass Prism." Mr. D. McLennan. (*North-Eastern Students' Section*).—Friday, February 12th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Joint meeting with graduates of the N.E. Coast Institution of Engineers and Shipbuilders. "Trend of Modern Power Station Design, with particular reference to Prime Movers." Mr. J. N. L. Tucker. (*London Students' Section*).—Friday, February 12th. Institution, London. 6.15 p.m. "Mercury-Arc Rectifier Phenomena." Mr. H. H. Taylour. Saturday, February 13th. 3 p.m. Visit to Ford Works, Dagenham.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, February 13th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Frequency Change-over, with Special Reference to Industrial Problems." Mr. T. H. Windibank.

Notes

N.E. Coast Power Men's Reunion

It has been suggested that a reunion shall be held in London of engineers who were at one time connected with the North-east Coast Power Companies. The reunion will take the form of a dinner, and provisional arrangements have been made to hold this at the Waldorf Hotel, W.C.2, at 8 p.m., following the meeting of the I.E.E. on February 25th. All who are able to attend should communicate with Mr. W. G. Bass, 506, Bush House, London, W.C.2, before February 10th.

Appointments Vacant

Canvasser for North-West Midlands Joint Electricity Authority.

Technical officer at the Admiralty Technical Pool.

An assistant installation superintendent and a storekeeper for Barking Electricity Department.

(See our advertisement pages to-day.)

The New Southend Tariffs

The tariffs recently introduced by Mr. A. C. Johnson, borough electrical engineer, Southend, should do much to encourage the use of electricity in that town. Subject to the installation of appliances of a reasonable capacity, the all-in domestic tariff includes a fixed charge of 12½ per cent. of the rateable value plus 1d. per kWh in winter and ½d. per kWh in summer. For off-peak water heating the consumer can hire-purchase his heater (fixed and wired) for a sum that includes the cost of energy. Alternatively he may pay ½d. per kWh, or else a fixed charge of 5s. per quarter plus £1 10s. per kW of plant installed.

For business premises the charge is from £12 to £8 per annum per kW of m.d. plus 1d. per kWh in winter and ½d. per kWh in summer. For industrial heating and cooking a fixed charge is made of £1 per quarter plus 1d. per kWh in winter and ½d. per kWh in summer. For power there is a fixed annual charge per kVA of £3 10s. for d.c. and £3 for a.c. plus ½d. per kWh. Demands in excess of 30 kVA are 10s. less. An assisted wiring scheme has also been introduced.

Plug-points at Bristol

With the object of showing how much more easily a house can be run if it has a sufficient number of plug points, the Bristol Circle of E.D.A. has arranged for the equipment of four all-electric houses at Henleaze. Cooking demonstrations will be given by the Corporation Electricity Department on two afternoons of each week while the houses are open. The houses were opened by the Lord Mayor.

Electric Ship Propulsion

Apart from British and American naval vessels, there are at present in the mercantile marine some 73 ships of about 1,135,000 s.h.p. fitted with steam turbo-electric and 129 ships of about 10,000 s.h.p. fitted with Diesel-electric propelling machinery. The greater number are owned in the United States.

The Lighting of London Cinemas

In view of the proposals for the unification of electricity supply in London and the danger of street explosions whereby the two systems of lighting at places of public entertainment might be simultaneously affected, the L.C.C. Entertainments Committee has under consideration the question of recommending the Council to amend its regulations for places of public entertainment so as to provide that one of the two independent systems of lighting required to be provided at places of public entertainment in London shall be a self-contained system installed on the premises. The Committee is in communication with the London and Home Counties Branch of the Cinematograph Exhibitors' Association of Great Britain and Ireland and other organisations with regard to the proposal.

If the suggested amendment is eventually adopted, electricity from a public supply undertaking and coal gas will not be accepted by the Council as providing two independent systems of lighting.

The Batti-Wallahs

On Friday, February 19th, Sir Ernest J. P. Benn, Bart., will address a luncheon of the Batti-Wallahs' Society at the Hotel Metropole on "Public Economy."

Messrs. W. M. Bowring, G. Scott Ram, O.B.E., Major P. A. Smith, O.B.E., and Roger T. Smith have been elected Batti-Wallahs.

France's Largest Electric Furnace

What is stated to be the largest electric arc furnace in France has lately been completed at the works at Marignac of the Société de l'Electricité Industrielle. It is used for the reduction of carbide, has a capacity of 12,500 kVA, and is operated by a.c., which is received at 60,000 V, stepped down first to 10,000 V, and then to between 60 and 175 V at 35,000 A.

Regenerative Tramcar Control

Representatives of the Scottish Tramways and Transport Association, meeting in Glasgow on January 29th, were interested in an experiment with the regenerative control equipment of British manufacture. Councillor P. J. Dollan, Convener of the Glasgow Transport Committee of Glasgow Corporation, speaking at a dinner in the evening, said that if they could effect a saving of 33 per cent. by the regenerative control system, it would mean a new industry for Great Britain, and at the same time bring new hope to tramway undertakings all over the country. Mr. Fitzpayne, general manager, Edinburgh Corporation Transport, said that the regenerative control system appeared to be one way in which they might be able to reduce the cost of electrical energy used.

A Fuseless Town

The South Carolina Power Co. has decided that all towns with fewer than 1,000 inhabitants should not employ fuses in private houses. Small circuit breakers are to be used in place of them. The town of Ridgeville is claimed to be the first fuseless town.

British Standard Specifications

In our leading columns recently we suggested that those engaged in purchasing engineering apparatus should make sure that their index of British Standard Specifications was up to date. It is now announced that a new edition of the index (40 pp.) is available from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1. The Institution has again taken a stand (18G2) at the British Industries Fair, where copies will be obtainable.

German Electrical Regulations

The Commercial Counsellor to H.M. Embassy at Berlin has forwarded to the Department of Overseas Trade copies, printed in English, of the regulations of the Verband Deutscher Elektrotechniker E.V. (Association of German Electricians) for (i) testing electrical machinery, (ii) testing transformers, (iii) insulated wires in high-voltage installations and for covered wires, and (iv) lead cables in high-voltage installations. These publications are available for loan to interested United Kingdom firms in order of application to the Department, 35, Old Queen Street, S.W.1.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Among those whom we were able to congratulate upon appearing in the New Year Honours List in our issue of January 8th, page 67, was **Mr. R. Withycombe,** of Zanzibar, who was appointed O.B.E. (Civil Division). Mr. Withycombe was appointed in 1907 engineer and manager of the Zanzibar Electric Light Co., which was then newly formed for the purpose of commencing a public supply of electricity in the island. In 1911 the company's undertakings were acquired by the Zanzibar Government, and Mr. Withycombe was appointed director of a separate department which was formed to run the supply. This position he still holds. It will interest readers to know that before going to Zanzibar he was at West Ham, being in charge, under the borough electrical engineer, of the electrical equipment of the tramways.

The committee which has been appointed to consider a memorial to the late **Sir John Monash,** who was chairman of the Victoria Electricity Commission, has decided that the most suitable form would be an equestrian statue. It is proposed to raise a fund of £10,000 for the purpose. **Mr. F. W. Clements,** the present chairman of the Electricity Commission, is a member of the committee, which represents the organisations and activities with which Sir John Monash was associated.

Sir Bernard E. Greenwell, Bart., has been elected chairman of the board of the County of London Electric Supply Co., Ltd., to fill the vacancy created by the death of Sir Harry Renwick, Bart. Sir Bernard has been a vice-chairman of the company since 1929. **Lt.-Col. Sir Frederick Hall, Bart.,** and **Sir Robert Renwick, Bart.,** have been elected vice-chairmen.

Sir Frederick Hall has been elected chairman of the South London Electric Supply Corporation, Ltd., the chairmanship of which was also made vacant by Sir Harry Renwick's death.

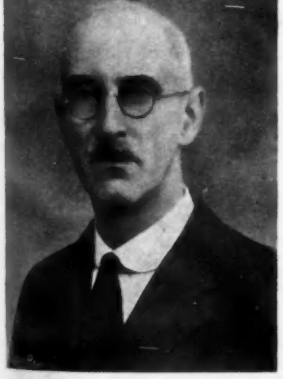
The Birmingham Electric Supply Committee has appointed **Mr. W. Lawson, M.I.E.E.,** to the post of special technical assistant to the city electrical engineer. Mr. Lawson will combine his new duties with the supervision of the meter and motor department of the Birmingham undertaking.

Mr. Sam Mavor, of Mavor and Coulson, Ltd., left Glasgow on the *Cameronia* for New York on January 30th.

Sir Phillip Nash has been elected a member of the Royal Institution.

Mr. E. V. Boddis and **Mr. H. F. Elliott,** respectively resident engineer and manager, and secretary of the Electricity Co. of Macclesfield, Ltd., an associated company of the Electrical Development & Securities Trust, Ltd., were recently presented with gold watches by Mr. H. L. Howard, chief engineer of the Trust, in appreciation of their services, Mr. Boddis having completed 21 years' service and Mr. Elliott 29 years.

Dr. T. A. McLaughlin, the late managing director of the Irish Free State Electricity Supply Board, is to be presented by the Board's staff with a large silver model of the Shannon power station at Ardnacrusha.



[Hudson Studios

Mr. L. S. Carr, constructional engineer at Birmingham, who has retired

On the occasion of his retirement from the service of the Birmingham City Corporation, **Mr. L. S. Carr, M.I.E.E., M.I.Mech.E.,** constructional engineer to the Electric Supply Department, was presented with some pieces of silver, subscribed for by the staff of the Department as a token of their goodwill and esteem. In making the presentation Mr. F. Forrest, city electrical engineer, alluded to the remarkable growth of the undertaking since Mr. Carr was first associated with it some twenty years ago, and indicated Mr. Carr's prominent responsibility in connection with the large plant extensions. Mr. E. J. Jennings, secretary and commercial manager, and other officials of the Department, supplemented Mr. Forrest's remarks and referred to the good feeling which had constantly existed between Mr. Carr and his colleagues.

Mr. Carr has also received from the Electric Supply Committee an illuminated engrossment on vellum of a Minute appreciating his services, and Mrs. Carr was associated with the proceedings by the gift of an antique silver cream jug.

Messrs. H. D. Vickery, G. R. Hutchinson, and **L. R. C. MacFarlane** have been appointed by the New Zealand Government to the Board of Control of wireless and broadcasting. Mr. Vickery is chairman.

Mr. A. H. Shaw, borough electrical engineer of Ilford, is retiring next March, and will be succeeded by **Mr. G. F. Gregory,** deputy electrical engineer, at a salary of £1,000 per annum, rising to £1,200.

[Elliott & Fry

Major R. W. Klitz, who has been appointed sales engineer to the Northern Ireland Electricity Board

As we briefly reported last week, the Electricity Board for Northern Ireland has appointed **Major R. W. Klitz, M.I.E.E.,** as sales engineer to take charge of the publicity and sales organisation. Major Klitz was educated at Gillingham Grammar School, Dorset, and subsequently passed the examinations of the City and Guilds of London in electrical engineering. He served his apprenticeship with the Westminster Engineering Co., and afterwards held appointments with the London Electric Supply Corporation, Ltd., and the Wimbledon Corporation, where he was chief assistant electrical engineer. He served in the War, enlisting as a sapper in the Royal Engineers in 1915, and ultimately attained the rank of major. On his return to civil life he was appointed sales engineer to the North Wales Power Co., Ltd., which operates in an area of over 4,000 sq. miles. He was responsible for the development of the load throughout this company's area, which embraces not only important industrial centres, but also widely scattered rural and farming districts, and he has had a wide experience in the application of electric power to works, factories, and farms, as well as to the requirements of the domestic consumer. Major Klitz has arranged to take up his duties with the Board at an early date, when he will be available to discuss with manufacturers and power users in the south-eastern area of Northern Ireland the question of taking supplies of power for their works from the Board's system.

Mr. J. J. Patterson has been appointed accountant to the Board.

Mr. H. Marryat and Mrs. Marryat have gone to India for a tour similar to that which they undertook in South Africa last year, states the *Electrical Contractor.*

Mr. E. W. Faithfull, who for the past seven years has been an assistant engineer with the Seaton and District Electric Light Co., Ltd., has been appointed assistant mains engineer to the Bridport Corporation Electricity Department. On leaving Seaton Mr. Faithfull was the recipient of a set of books from the staff, which were formally presented to him by Brig.-Gen. G. B. Smith, C.B., chairman of the company.

The following are the new officers of the Faraday House Old Students' Association for the current year: President, **Major C. E. Prince, O.B.E.;** vice-president, C. R. D. Pritchett; Members of the Council: T. S. Andrew, A. H. Bennett, M. D. Cloran, L. B. Hewitt, and A. M. Midgley.

Mr. C. G. Tegetmeier, who is deputy-chairman of the South Metropolitan Electric Tramways and Lighting Co., Ltd., and a director of a number of other companies, has retired from the chairmanship of the Swansea Improvements and Tramways Co., Ltd.

Mrs. F. A. Barnard, of Withersdane Hall, Wye, has been appointed president of the Ashford and District Branch of the Electrical Association for Women. The branch, which recently held its annual meeting and an American supper, has 60 local members.

Mr. D. S. Paxton, after an association extending over twenty years with the Brown-Boveri organisation, has joined Messrs. Daniel Adamson & Co., Ltd., Dukinfield, and sailed for India from Marseilles on February 1st in order to take over the management of their Indian branch.

Obituary

Mr. J. H. Shaw.—The death occurred recently of Mr. James Henry Shaw, M.I.E.E., staff engineer in the Department of Posts and Telegraphs, Dublin. He was about 55 years of age, and as engineer in the service of the Government for many years he did much pioneer work in the Post Office telephone service. He was a past-chairman of the Irish Centre of the Institution of Electrical Engineers.

Herr E. Schubert.—The death is reported at the age of 48 years of Herr Erich Schubert, the chief engineer of the Garbe-Lahmeyer Co., of Aix-la-Chapelle.

Legal

Displaced Under an Electricity Scheme

In the King's Bench Division on Monday last Mr. Justice MacKinnon had before him a special case stated by Sir Harold Morris, K.C., as referee, which raised a question as to the construction of Section 16 of the Electricity (Supply) Act, 1919.

The matter arose out of the closing in 1930 of the Lero and Aylestone generating stations, which resulted in 11 men losing their employment, and 25 suffering a diminution of wages and status.

The generating stations belonged to the Leicester Corporation electricity undertaking, and the men in question claimed that they were entitled to compensation under the Electricity (Supply) Act, 1919. The supply of electricity is now concentrated and comes from a new power station under an electricity scheme.

Sir Harold Morris found as a fact that the men had lost their employment in consequence of the coming into operation of the scheme, but as their dismissal took place more than five years after the scheme came into operation, they could not recover any compensation under the Act.

Sir Stafford Cripps, K.C., argued the case for the workmen and Mr. Montgomery, K.C., for the Corporation.

His Lordship upheld the award of the referee, and said the scheme under which the closing took place was said by the Corporation to be a scheme made under Sections 3 and 7 of the Act and approved by Parliament in June, 1924. That was more than five years before the loss of employment. He therefore dismissed the appeal.

Electrical and Musical Industries Litigation

On Tuesday last in the Chancery Division Mr. Justice Eve had before him a motion for judgment by Electrical & Musical Industries, Ltd., against Warner-Brunswick, Ltd.

The motion, said counsel, was a patent one, and the only question was one of damages, and this had been agreed at a nominal amount.

His Lordship entered judgment as arranged.

Mr. Justice Farwell also had before him a motion for judgment by the Electrical & Musical Industries, Ltd., against R. Cadisch & Sons, and his Lordship made the order as asked for by counsel.

Action Against Irish Electricity Board

On January 29th the renewed hearing was begun before Mr. Justice Meredith at Dublin of an application by Mrs. E. R. Martin, Roebuck Grove, Clonskeagh, Dublin, for an injunction to restrain the Electricity Supply Board from trespassing on her lands, cutting down trees, and erecting electric standards. She also asked for a mandatory injunction to compel defendants to take down the standards and restore the lands to their original condition.

The case had been before the Court previously and had been adjourned with a view to a settlement. The parties had, however, been unable to agree.

For the plaintiff, Mr. Jellett, K.C., said that this was the first instance in which poles had been erected on the lawn in front of a private house. There were stated to be "special engineering reasons," but the defendants did not disclose what they were.

Mr. Marnan, on behalf of the defendants, claimed that the poles did not spoil the amenities of the plaintiff's residence and that on the report of their engineers the defendants considered that they were entitled to keep the poles where they were.

The hearing was adjourned.

Two Marconi Actions

In the Chancery Division on Tuesday last Mr. Justice Eve had before him the case of Marconi's Wireless Telegraph Co., Ltd., against R. Cadisch & Sons, which was a motion for judgment by consent.

Counsel said there was nothing in the order that the Court could take exception to. There was to be an injunction, certain payments for valves, and nominal damages.

His Lordship entered judgment by consent on the terms mentioned by counsel.

Mr. Justice Farwell had before him a motion for judgment by Marconi's against Warner-Brunswick, Ltd. Defendants consented to the order, and his Lordship entered judgment accordingly.

Fraudulent Consumption of Electricity

For tampering with an electricity meter and preventing it from registering, Joseph Jolly, 6, Raby Avenue, King's Lynn, was fined £2 by the King's Lynn magistrates on January 25th.

John Moss, 50, Surrey Road, Blackburn, was bound over for six months on January 26th for consuming electricity belonging to the Blackburn Corporation by connecting up wires to the main to cut out the meter. Owing to non-payment of his account the electricity supply to Moss's house had previously been disconnected.

At the Leigh County Police Court on January 27th James Roberts, 13, Clegg Street, Astley, was charged by the Lancashire Electric Power Co. with fraudulently consuming electricity by connecting the wires of his house with the main supply cable. Failure to pay his electricity bill had led to Roberts's supply being cut off in March, 1928, when the meters and fuses were taken away. A fine of 40s. was imposed.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Southern United Telephone Cables, Ltd.—Private company. Registered February 1st, with a nominal capital of £100 in £1 shares. Objects: To carry on the business of manufacturers of telephone, telegraph, submarine and other cables and wires for electrical purposes, electrical engineers and contractors, and manufacturers of electrical apparatus in all its branches. Power is also taken to carry on the business of an electric lighting and power company. The subscribers are: W. F. Bishop, Ashridge, Ridgeway, Enfield; J. S. Huddleston, "Craiggowan," Hornchurch, Essex; the Earl of Verulam, Lincoln House, 296, High Holborn, W.C.1; and C. Pipkin, 13, Sundridge Avenue, Bromley, Kent. The first directors are to be appointed by the subscribers. Secretary (pro tem): J. H. Roberts. The registered office is at Dagenham Dock, Essex.

Petbow, Ltd.—Private company. Registered January 30th. Capital, £3,500 in £1 shares. Objects: To acquire from J. A. Peters the benefit of certain existing inventions or processes relating to electrodes; and to acquire the business of electrical equipment and electrode dealer and manufacturer now carried on by J. A. Peters at Victoria Works, Willesden, and elsewhere. The permanent directors are: J. A. Peters, 30, Caldecote Street, Newport Pagnell, Berks, and H. P. Bowler, 100, Queen's Gate, S.W.7. Registered office: Victoria Works, Avenue Road, Willesden, N.W.10.

Glenties Electricity Supply Board, Ltd.—Public company. Registered in Dublin January 22nd. Capital, £2,000 in £1 shares. Objects: To carry on the business of electricians, buyers and sellers of and dealers in electrical appliances of all kinds, &c. The directors are: W. O'Donnell, A. McDevitt, P. McDevitt, Dr. J. J. McNeill, C. Kennedy, M. Forker, J. Kenny, P. Byrne, and T. Campbell, all of Glenties, Co. Donegal.

Hastings Factors, Ltd.—Private company. Registered January 25th. Capital, £1,000 in £1 shares. Objects: To carry on the business of designers and manufacturers of, agents for and dealers in, radio, electrical, automobile apparatus and appliances, &c. The subscribers are: J. Hollingsworth and L. J. Hollingsworth, 40, Quarry Road, Hastings, Sussex. J. Hollingsworth is permanent director and chairman.

Wynne Battery Co., Ltd.—Private company. Registered January 23rd. Capital, £1,000 in 1,536 10 per cent. cumulative preference shares of 10s. and 4,640 ordinary shares of 1s. each. Objects: To carry on the business of electrical and mechanical engineers and manufacturers, dealers in batteries, &c. The subscribers are: F. Willis, 57, Creighton Avenue, N.10, solicitor's managing clerk, and E. T. Horne, 14, Samos Road, Anerley, S.E.20. Solicitors: Bischoff, Coxe, Bischoff & Thompson, 4, Great Winchester Street, E.C.

Wireless Instruments (Leeds), Ltd.—Private company. Registered January 23rd. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, wireless, television, mechanical and general engineers, &c. The subscribers are: R. J. Pattinson, 5, Woodland Grove, Newton Road, Leeds, and C. Colbeck, St. John's House, Dewsbury. Solicitor: W. Bateson, 38, Albion Street, Leeds.

Boyce Brothers, Ltd.—Private company. Registered January 28th. Capital, £2,100 in £1 shares. Objects: To carry on the business of television, wireless telegraphy and telephone manufacturers, electrical and accumulator engineers, &c. The directors are: J. B. Parlour, 52, High Street, Highgate, and J. B. Quinn, "Beltinge," Ballards Way, Croydon. Registered office: 52, High Street, Highgate.

J. F. May & Co., Ltd.—Private company. Registered in Belfast on January 15th. Capital, £1,000 in £1 shares. Objects: To carry on the business of dealers in electrical fittings, wireless apparatus, &c. The directors are: J. F. May, 9, Hazeldene Gardens, Bangor, Co., Down, and W. F. May. Registered office: 33, Central Avenue, Bangor, Co. Down.

Northern Radio Construction Co., Ltd.—Private company. Registered January 23rd. Capital, £100 in 10s. shares. Objects: To carry on the business of manufacturers and producers of radio-gramophones, wireless and television apparatus, &c. The subscribers are: E. H. George and R. A. E. A. Wysard, both of 22, Grosvenor Street, W.1. Solicitor: A. C. N. Dixey, 22, Grosvenor Street, W.1.

Cordo Electrical Products, Ltd.—Private company. Registered January 27th. Capital, £100 in £1 shares. Objects: To carry on the business of consultants, manufacturers of and dealers in electrical apparatus of all types, including wireless. The first directors are: L. E. T. Branch, 15, The Crescent, Ilford, and F. Squirrel, 15, Harrington Road, South Norwood, S.E.25. Registered office: 68, Victoria Street, Westminster, S.W.1.

Returns of Electrical Companies

Peacehaven Electric Light & Power Co., Ltd.—Capital £20,000 in 962 preference shares of £1, 14,038 preference shares of 12s., 192,564 ordinary shares of 1s., and 3,948 ordinary shares of 5s. each. Return dated October 7th, 1931. 13,883 12s. preference and 16,027 1s. ordinary shares issued and fully paid up. Mortgages and charges: £5,770.

Lincoln Smethurst, Ltd.—W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., was appointed receiver and manager on January 22nd, under powers contained in trust deed dated August 31st, 1931.

Pernambuco Tramways & Power Co., Ltd.—Issue on December 19th, 1931, of £22,500 5 per cent. debentures, part of a series already registered.

Robinson & Hands Electric Co., Ltd.—Capital £5,000 in 20 ordinary and 4,980 preference shares of £1 each. Return dated December 21st, 1931. 20 ordinary and 4,232 preference shares taken up. £4,252 paid. Mortgages and charges: Nil.

Sudan Light & Power Co., Ltd.—Capital £450,000 in 94,000 preference and 356,000 ordinary shares of £1 each. Return dated July 27th, 1931. 52,000 preference and 356,000 ordinary shares taken up. £408,000 paid. Mortgages and charges: £400,000.

Electrical Wiring Investment Co., Ltd.—Particulars filed of £5,000 debentures authorised December 30th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,000.

F. Parks, Ltd.—W. H. W. Greenslade, of Finsbury Circus House, E.C., was appointed receiver on January 22nd, under powers contained in debenture dated June 1st, 1928.

Drake & Gorham, Ltd.—Capital, £125,000 in £1 shares. Return dated November 13th, 1931. All shares taken up. £85,000 paid. £40,000 considered as paid. Mortgages and charges, £71,215.

Berkeley Electrical Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated December 10th, 1931. 9,000 shares taken up. £9,000 paid. Mortgages and charges, nil.

Midhurst & District Electricity Co., Ltd.—Satisfaction in full on December 29th, 1931, of debenture dated January 24th, 1929, and registered January 29th, 1929. (According to the register of mortgages, the debenture registered January 29th, 1929, originally secured £5,000 and further advances and premium of 5 per cent.)

City Notes

The Central Electricity Board on Tuesday last made an issue of £7,000,000 of 5 per cent stock, 1955-75 at 95. This, with previous issues, makes the total stock outstanding £26,000,000 nominal. The new issue will rank, *pari passu*, with stock previously issued, and the proceeds will be used to provide further funds for the construction and acquisition of main transmission lines, the cost of standardisation of frequency, working capital, and other authorised purposes, including payment of interest on the stocks already issued so far as it is payable on the capital, and on the stock now being issued until December 31st, 1939, if and so far as the expenditure does not become remunerative at an earlier date. The prospectus showed that over 2,310 miles of the 3,968 miles of overhead main transmission lines specified in the Board's various schemes have been constructed, and about 910 miles of these lines have been put into operation in order to facilitate standardisation or to give supplies to authorised undertakers who would otherwise have had to install generating plant. Construction work in the Central Scotland Scheme has been completed, and such progress has been made with the standardisation of frequency that it is anticipated that during the current year normal trading will commence in that area with the owners of stations at which the Board's electricity will be generated. Construction work in several other areas is well advanced.

The Traction & General Investment Trust held its annual meeting on January 28th, Mr. H. A. Vernet (chairman) presiding. In the course of his speech the chairman said that after a series of years in which income had advanced, the year 1931 had brought a definite check, the net revenue, as compared with that of the previous year, having declined by £4,812, or rather more than 5¼ per cent. Judging from present appearances revenue was likely to show a further diminution in 1932, but it was extremely difficult at the present time to make a safe and reliable estimate. As the outcome of the calamitous events of the past year they were confronted with an estimated depreciation of over 22 per cent. in the book value of their investments, or about 6½ per cent. net if the reserve account and amount carried forward were deducted.

Turner & Newall, Ltd., held their annual meeting on January 28th, when Mr. S. Turner (chairman), who presided, in the course of his speech, said that the asbestos cement section of the organisation continued to make progress, and in spite of prevalent conditions the volume of sales was about the same as in the preceding year. The Erith works of the British Fibrocement Works, Ltd., and the Widnes works of Bell's Poilite and Everite Co., Ltd., had been extended, and they were equipped to meet competition both at home and abroad. The pooling of experience and technical knowledge between them and the principal manufacturers of asbestos cement products on the Continent was a source of great strength to all parties concerned.

The Metropolitan Electric Cable & Construction Co., Ltd., reports a net profit of £21,791 for the year ended December 31st last, to which is added £590 brought forward, making £22,381. From this is deducted £7,500 for taxation reserve and £8,000 for general reserve. It is proposed to pay a final dividend of 5 per cent., making 10 per cent., tax free, for the year, leaving £881 to be carried forward. The report states that trading conditions during the year have again been very difficult, but the fall in the rate of gross profit earned has been compensated for by a greatly increased turnover. Meeting: February 5th.

Evershed & Vignoles, Ltd., are applying for the Court's sanction to certain alterations in their Memorandum of Association, giving the company powers "to invest and deal with the moneys of the company not immediately required for use in its business in such investments and generally in such manner as may from time to time be determined." Another alteration provides for the introduction of superannuation and welfare schemes for employés.

Fuller particulars of the alterations appear in our advertisement pages.

Baird Television, Ltd.—According to the daily Press it is understood that the Gaumont-British Picture Corporation has secured control of Baird Television, Ltd., by the purchase through one of the Gaumont-British subsidiaries of 800,000 Baird deferred ordinary shares. Voting control will be vested in a syndicate which has been registered with the title of L.B.T., Ltd., the directors of which will be Mr. Maurice Ostrer, who is on the board of Gaumont-British, and Mr. Sydney Moseley, vice-chairman of Baird Television.

The Metropolitan Railway Co. proposes to pay a final dividend of 1½ per cent. on the ordinary stock, making 2½ per cent. for the year (against 3½ per cent.). After providing for expenses in connection with the London Passenger Transport Bill (£9,288), the amount carried forward is increased from £33,500 to £41,500. The dividend on the surplus lands stock is increased from 2½ per cent. to 2⅝ per cent., making 4⅛ per cent. for the year, as against 4 per cent. in 1930.

The County of London Electric Supply Co., Ltd., has placed privately about £500,000 of 5 per cent. debenture stock. The new stock will be identical with the existing 5 per cent. debenture stock, and a full half-year's interest will be paid on June 1st next. Dealings are expected to begin at about 99¼, free of stamp.

The St. James' & Pall Mall Electric Light Co., Ltd., is to hold an extraordinary meeting on February 23rd, when a resolution will be submitted increasing the capital from £800,000 to £1,000,000 by the creation of 200,000 £1 shares. The annual meeting will be held at the conclusion of this meeting.

Einstein's Electro-Chemical Process, Ltd., will hold an extraordinary meeting on February 17th, when a resolution will be considered changing the name of the company to Electro-Chemical Process, Ltd. The next accounts will be made up to March 31st, 1932, instead of December 31st, 1931.

The City of Buenos Ayres Tramways Co. (1904), Ltd., proposes a final dividend of 1s. 3d. per share, making 5 per cent., less tax, for the past year (same). Amortisation and general fund receives £8,500 (same) and £1,809 (£591) is carried forward.

The Newcastle-upon-Tyne Electric Supply Co., Ltd.—A resolution approving the amalgamation of eight subsidiary companies with the company was passed at a recent meeting.

The Hydro-Electric Securities Corporation has declared the usual half-yearly dividend at the rate of 5 per cent. per annum on the class "B" preferred stock.

Siemens & Halske A.G., have announced a dividend of 9 per cent. for the past year, as compared with 14 per cent. in the preceding year.

The Siemens Schuckertwerke is not paying a dividend, the losses for the year being covered from reserves.

Stocks and Shares

TUESDAY EVENING.

THE reopening of Parliament on the Tuesday in this week is hoped, rather than expected, to precede by a couple of days the lowering of the Bank Rate to 5½ or 5 per cent. The last alteration in the latter was made on Sunday, September 20th; the date officially is given Monday, September 21st. The present Bank Rate is out of step with monetary conditions, but has been retained as a precautionary measure in view of the disturbances abroad, and the financial difficulties which have arisen in America. In anticipation of reduction in the Rate, gilt-edged stocks have been moving up in price, and are now within easy distance of the levels at which they stood before the country departed from the gold standard. Had it not been for the imbroglio between Japan and China, it is quite likely that the securities would have been advanced still farther, but the serious news from the Far East laid a check upon investment, and brought about a reaction in prices.

New Issues

Central Electricity 4½ per cent. stock rose 2 points to 89, but reverted to the previous figure of 87 upon publication of the prospectus of £7,000,000 of 5 per cent. stock at 95, with a full half-year's interest payment in October next. The yield outright is 5¼ per cent., and redemption at the later of the two dates—1955-1975—adds a few pence more per cent. to the yield. The stock is not available for trustees unless they have special powers to invest money in it, but the security is irreproachable, and it is only the size of the present issue which gave rise to a doubt as to whether the public would take the whole amount now offered, or whether part of the issue would be left in the hands of the underwriters.

The new County of London Electric 5 per cent. debenture stock can be bought about 99¼, free of stamp and fee. To meet the annual service of interest of £275,000, there was available on the last published profits £1,308,000. A full half-year's interest will be payable on the stock on June 1st next. Redemption must be effected by 1972 at 100, but the company has the right to pay off the issue at this price any time after 1965.

Home Railway Stocks

The Metropolitan Railway caused considerable disappointment to the Home Railway market by announcing a dividend of 1½ per cent. for the second half of 1931, making 2½ per cent. for the full year. It was not only that this compared with 3½ per cent. in the previous year which caused regret; but, by

reducing the dividend below 3 per cent., the Metropolitan Railway excluded its prior-charge stocks from the list of strict trust securities into which the payment of 3 per cent. would have permitted their entry, 1931 being the tenth year in which 3 per cent., or more, had to be paid in order to give the stocks the extra cachet which strict trust rank bestows. The Metropolitan Railway stocks fall into the list of Chancery trust stocks, and are eligible for investment by trustees who are not bound by the strict trust requirements. If it should happen that the Metropolitan is absorbed under the London Passenger Transport Bill, the company's guaranteed and preference issues will become exchangeable for London Transport "A" and "B" stocks, which will possess the status of strict trustee securities. The dividend on the company's Surplus Lands stock has been raised by ½ per cent. to 4½ per cent. The effect upon the price of the ordinary was to cause a fall of 3 points to 35½, and to lead to a sympathetic drop in Districts to 55½. Underground ordinary shares were lowered to 18s. 6d. Central London assented stocks have each fallen a point to 66½. The company's unassented ordinary stock stands at 60½, the preferred at 56, and the deferred at 60½. The last time the deferred changed hands, according to the Stock Exchange Official List, was in May two years ago, the price then being 77½. The dividend announcements of the Underground group will be made on February 11th.

Home Electricity Supply

Charing Cross ordinary shares are up 6d. to 28s. 6d., and Westminsters gained a similar amount at 26s. The rest of the list shows no change. There is still a marked absence of activity in the new shares issued by the electricity supply companies through the partial distribution of their reserves. As mentioned last week, the dealers in the market state that the public appear to be willing to take up their allotted proportions without, however, adding to their holding. The Provincial list is as quiet as that of the London shares. Scottish Power are better at 27s. Amongst the miscellaneous issues, Atlas remain at 11s., and the preference are quoted at 20s. 9d. Northamptons at 39s. stand at the same price as Richmond (Surrey). Of the new shares, Midland Counties are quoted at 25s. 9d., Metropolitan Electrics 37s. 6d., Charing Cross 26s. 9d., and Westminsters 25s. 3d. The St. James' and Pall Mall is the next company from which an issue of new shares is anticipated.

Cables and Wireless

After showing a moderate amount of strength, the market in Cables & Wireless stocks turned easier. The two ordinary stocks are each ½ down at 17½ and 10½ for the "A" and "B" respectively. Publication of the results achieved for the whole of 1931 served to arouse a little attention for a few days, but the effect was quickly lost, and the market has relapsed into a condition of quietude. Nor can it be said that the American Telephone stocks are any more animated. American Telephone & Telegraph capital stock recovered to 170 after having gone back to 165. Internationals are unchanged at 14. The name of the Automatic Telephone Manufacturing Company is now altered to the Automatic Electric Company.

Manufacturing and Equipment

Telegraph Construction shares continue to fall, and at £10 are again a point down on the week. On the basis of the last-paid 7½ per cent. dividend, the yield is 9 per cent. on the money. It is, however, considered doubtful whether the company will maintain the previous rate, which, it may be recalled, was cut from 10 per cent. for 1929. The company is financially strong, but business conditions have been such as to arouse these doubts as to the likelihood of the full 7½ per cent. dividend being repeated. Callenders are steady at 48s. 9d., Enfields at 77s. 6d., Henley's at 97s. 6d. It is thought that the Government will tackle the tariff question on Thursday in this week. Moreover, the new issue of Central Electricity stock hints at a good deal of new work for the equipment undertakings. The companies concerned with manufacturing and equipment of electrical apparatus are expected to derive a moderate amount of benefit from the imposition of fresh tariffs. General Electrics have eased off to 41s. 3d. and Associated Electrical Industries to 20s. The ferment in the Far East introduces an ironical touch on the eve of the World Disarmament Conference. From the Stock Exchange point of view, the principal effect is a general fall in the prices of Japanese and Chinese issues. Tokio Electric sixes at 80½ have shed 7 points.

Iron and steel shares keep moderately steady. Vickers touched 9s. before reacting a trifle. The rubber share market shows no sign of vitality.

Traction and Tramway

Brazilian Tractions at 16 ex dividend show a slight fall on the week. The company has resumed dividend payments with 25 cents per quarter, offering a return at the present price of a little over 6 per cent. on the money. The company's 6 per cent. preference shares stand at 90, and are in receipt of their full dividends. The Anglo-Argentine Tramways group shows no alteration on the week. In the list of British sterling stocks, British Electric Traction deferred has fallen 45 points to 675. When a stock arrives at such an exalted level as that occupied by B.E.T. deferred, it requires, of course, very little either of supply or demand to bring about a considerable change in the price. Dealings have taken place within the past few days on the basis of 675.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Feb. 2, 1931.	Rise or Fall.	Yield p.a. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	—	5 1 6
Central Electricity 4½% Deb.	Stock	—	4½	87	—	5 3 6
Charing Cross Ordinary	1	8½	8½	28/-	+6d.	5 0 0
Chelsea	1	8½	8½	26/-	—	5 7 8
City of London	1	10	10	33/9	—	5 17 10
Clyde Valley	1	8	8	31/3	—	5 2 5
County of London	1	11	11	44/6	—	4 18 10
Edmundsons' 7% Pref.	1	7	7	23/6	—	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/-	—	4 16 7
Lancs. Light and Power	1	7	6½	24/6	—	5 6 0
London & Home Counties 4½% Deb.	Stock	—	4½	87	—	5 3 6
London Electric	1	8½	9	33/-	—	5 9 1
Metropolitan	1	9	10	38/9	—	5 3 3
Midland Counties	1	6½	7	27/-	+9d.	5 3 8
Mid. Elec. Power	1	15	8	28/9	—	5 11 4
Newcastle-on-Tyne Ordinary	1	6	6	23/3	—	5 3 3
Do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	28/6	—	4 18 3
Scottish Power	1	8	8	27/-	+9d.	5 18 5
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/-	—	5 3 8
Westminster Ordinary	1	8½	8½	26/-	+6d.	5 7 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	30/9	—	5 4 1
HOME RAILS						
Central London Ord. Assented	Stock	4	4	66½	−1	6 0 4
Metropolitan	,,	4	3½	35½	−3	9 17 2
Do. District	,,	5	5	55½	−3	9 0 2
Underground Electric	1	8	8	18/6	−1/-	8 13 0
TELEGRAPHS AND TELEPHONES						
Anglo-Am. Tel. Pref.	Stock	6	6	90	—	6 13 4
Do. Def.	,,	1½	1½	21	—	6 19 6
Cables & Wireless 5½% Pref.	Stock	5½	5½	48½	—	—
Do. A 7½% Ord.	,,	Nil	—	17½	−½	—
Do. B Ord.	,,	Nil	—	10½	−½	—
Globe Tel. and T. Ord.	10	10	8½	7	—	—
Do. do. Pref.	10	6	6	7	—	8 11 6
Great Northern Tel.	10	20	20	22	+½	9 1 10
Marconi-Marine	1	15	15	31/3	—	9 12 0
Oriental Telephone Ord.	1	12	12	2½	—	*5 16 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	3/9	—	—
Do. do. 5% Deb.	Stock	5	5	14½	—	—
British Electric Traction Def. Ord.	,,	5	5	675	−45	—
Do. do. Pref. Ord.	,,	8	8	110	—	7 5 6
Brazil Traction	100	8	—	16xd	—	6 5 3
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	81	—	6 3 5
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/3	—	—
London United Tram Deb.	Stock	4	4	55½	—	7 4 2
Mexico Trams, 5% Bonds	—	5	5	32½	—	15 7 8
Mexican Light Common	100	Nil	Nil	22½	+2½	—
Do. 7% Pref.	100	7	7	30½	+½	22 19 0
Do. 1st Bonds	—	5	5	60½	—	8 5 4
Victoria Falls Ord.	1	15	15	55/-	—	5 9 1
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	1	6	6	1	−½	6 0 0
Do. Pref.	1	8	8	26/3	—	6 2 0
Babcock & Wilcox	1	15	14	43/9	—	*8 9 0
British Aluminium Ord.	1	10	10	23/3	−6d.	8 12 0
British Insulated Ord.	1	15	15	2½	—	5 11 7
Brush Ord.	Stock	10	5	60	—	8 6 8
Callender's	1	15	15	2½	—	6 3 1
Do. 6½% Pref.	1	6½	6½	22/6	—	5 15 5
Crompton Parkinson Ord.	5/-	30	30	18/9	—	8 0 0
Do. 8% Pref.	1	8	8	26/3	—	6 2 0
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	89½	—	5 11 10
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3½	—	6 8 10
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	7/6	—	—
Ferranti Pref.	1	7	7	20/9	—	6 15 0
G.E.C. Pref.	1	6½	6½	23/-	—	5 13 1
Do. Ord.	1	14	10	41/3	−9d.	4 16 10
Henley's	1	30	30	4½	—	6 3 1
Do. 4½% Pref.	5	4½	4½	4½	—	5 9 1
India-Rubber	1	Nil	Nil	5/9	—	—
Johnson & Phillips	1	10	10	23/9	—	8 8 5
Siemens Ord.	1	7½	7½	21/3	—	7 1 2
Telegraph Construction	12	10	7½	10	−1	9 0 0

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930

19,970. "Electric discharge tubes." H. J. Spanner. July 2nd, 1929. (364,578.)
20,579. "Power converting apparatus." British Thomson-Houston Co., Ltd. July 8th, 1929. (364,579.)
20,636. "Supply of electrical energy." Akt.-Ges. Brown, Boveri et Cie. September 28th, 1929. (Patent of addition not granted.) (364,643.)
20,938. "Static regulating apparatus for alternating current voltages." Soc. Anon. pour l'Exploitation des Procès M. Leblanc-Vickers. July 24th, 1929. (364,644.)
22,604. "Systems for controlling switching operations in telephone exchanges by means of alternating current impulses." Telefonaktiebolaget L. M. Ericsson. July 27th, 1929. (364,532.)
23,122. "Radio receiving apparatus." British Thomson-Houston Co., Ltd., and T. H. Kinman. July 31st, 1930. (364,580.)
23,571. "Searchlights." W. W. Triggs (Ceskomoravska-Kolben-Danek Co., Ltd.). August 15th, 1931. (364,687.)
25,958. "Wave filters." Siemens & Halske Akt.-Ges. August 31st, 1929. (364,561.)
26,108. "Automatic electric circuit breakers." Allgemeine Elektricitäts Ges. February 8th, 1930. (364,620.)
26,294. "Cathodes of vacuum tubes." Soc. des Lampes Fotos. September 5th, 1929. (364,583.)
27,152. "Oscillation generators." Marconi's Wireless Telegraph Co., Ltd. (W. Albersheim). September 11th, 1930. (364,658.)
28,304. "Means for preventing electrolytic disintegration." British Thomson-Houston Co., Ltd. September 23rd, 1929. (364,538.)
28,665. "Electric radiators or heaters." Wardle Engineering Co., Ltd., and E. E. Hopwood. September 25th, 1930. (364,541.)
28,680. "Electric motor-starting apparatus." Brookhirst Switchgear, Ltd., and W. A. Lane. September 25th, 1930. (364,563.)
28,911. "Microphones and apparatus for use therewith." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. September 26th, 1930. (364,564.)
29,543. "Electric discharge tubes." Siemens-Reiniger-Veifa Ges. für Medizinische Technik. October 24th, 1929. (364,568.)
29,641. "Multiplex electric signalling systems." Standard Telephones & Cables, Ltd., M. Van Hasselt, K. E. Latimer, and A. L. Long. October 3rd, 1930. (364,569.)
29,643. "System of electric traction utilising compound motors." L. Bacqueyrisse. October 8th, 1929. (364,553.)
29,650. "Electric heat storing apparatus." G. Wilkinson and Vulcansons, Ltd. October 3rd, 1930. (364,664.)
29,655. "Arcing preventing devices for electric switches." British Thomson-Houston Co., Ltd. October 3rd, 1929. (364,630.)
29,837. "Means and method of applying a surface layer of grease or the like to an electric cable." Standard Telephones & Cables, Ltd., and H. S. Bishop. October 6th, 1930. (364,572.)
29,890. "Manufacture of electric cables." S. K. Anderson. October 6th, 1930. (364,575.)
29,899. "Multi-core electric cables." Norddeutsche Kabelwerke Akt.-Ges. October 5th, 1929. (364,670.)
29,926. "Direct current series circuit power systems." British Thomson-Houston Co., Ltd., H. Orchard, and J. A. Jaffrey. October 6th, 1930. (364,576.)
29,927. "Control of electric propulsion machinery." British Thomson-Houston Co., Ltd., H. Orchard, and J. A. Jaffrey. October 6th, 1930. (364,577.)
30,166. "Short wave oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and E. W. B. Gill. October 8th, 1930. (364,637.)
30,192. "Cable joints." Telefonaktiebolaget L. M. Ericsson. March 24th, 1930. (364,676.)
30,400. "Diaphragm mountings for acoustical apparatus." F. W. Lanchester. October 10th, 1930. (364,683.)
30,976. "Submarine cable signal transmission systems." Standard Telephones & Cables, Ltd., E. K. Sandeman, B. B. Grace, A. H. Roche, and T. S. Skillman. October 16th, 1930. (Addition to 342,370.) (364,704.)
31,152. "X-ray apparatus." British Thomson-Houston Co., Ltd. October 18th, 1929. (364,706.)
31,337. "Electric cables." British Insulated Cables, Ltd., and J. L. Packer. October 20th, 1930. (364,710.)
31,574. "Electrolytic deposition of silver." Kodak, Ltd. October 22nd, 1929. (364,711.)
32,252. "Means for controlling the switching processes in telegraphic apparatus." Siemens & Halske Akt.-Ges. October 28th, 1929. (364,720.)
32,492. "Electric cables." Callender's Cable & Construction Co., Ltd., L. G. Brazier, and R. S. Vincent. October 29th, 1930. (364,725.)
33,012. "Electrically driven clocks." M. A. Halle (O. Neumann). November 3rd, 1930. (364,736.)
33,288. "Automatic telephone exchange systems provided with means for establishing long distance telephone connections." Telefonaktiebolaget L. M. Ericsson. November 6th, 1929. (364,740.)
34,303. "Wireless receiving apparatus." T. A. Biddington and R. Field. November 14th, 1930. (364,754.)
35,579. "Electric totalisators." Ericsson Telephones, Ltd., F. Limb, and G. A. Bryden. November 26th, 1930. (364,764.)
36,062. "Elevator control system." Waygood-Otis, Ltd January 16th, 1930. (364,773.)
36,515. "High frequency coupling arrangements." Marconi's Wireless Telegraph Co., Ltd. December 3rd, 1929. (364,777.)
36,714. "Electric signalling systems." General Electric Co., Ltd., G. C. Marris, and D. C. Espley. December 5th, 1930. (364,779.)
36,788. "Directional radio transmitters and receivers for use on very short waves." Telefunken Ges. für Drahtlose Telegraphie, and W. Ludenia. December 21st, 1929. (364,782.)
37,212. "Device to be used in conjunction with gas, coal, or electric fires." T. Jamieson. July 22nd, 1931. (364,791.)
37,410. "Plug and socket connectors for electric circuits." C. L. Arnold and M. K. Electric, Ltd. December 11th, 1930. (364,797.)
37,820. "Electrical protective devices." Gramophone Co., Ltd., and H. Clarke. December 15th, 1930. (364,802.)
38,241. "Apparatus for use in starting heavy rotors." T. Fraser and Associated Electrical Industries, Ltd. December 18th, 1930. (364,811.)
38,535. "Automatic switches for electrically wound clockwork mechanism and the like." Horstmann Gear Co., Ltd., A. and B. G. Horstmann. December 22nd, 1930. (364,817.)
38,780. "Electric transformer tap-changing apparatus." H. Diggle, K. G. Glover, and Associated Electrical Industries, Ltd. December 23rd, 1930. 364,821.)
39,123. "Electric battery lamps." Bosch Akt.-Ges. December 30th 1929. (364,826.)

1931

337. "Electric signalling systems." General Electric Co., Ltd., N. C. Smart, and A. A. Chubb. January 5th, 1931. (364,834.)
556. "Electric high tension sleeve insulators." Micafil Akt.-Ges. Werke für Elektro-Isolation. June 17th, 1930. (364,839.)
1,301. "Insulating blocks for electric heating elements." R. Haddan (Moffats, Ltd.). January 14th, 1931. (364,854.)
2,504. "Apparatus for controlling electrically the light value of a lamp for printing photographs." W. C. Vinten, W. J. Sadler, and W. Vinten, Ltd. January 26th, 1931. (364,869.)
2,873. "Automatic or semi-automatic telephone systems." Ericsson Telephones, Ltd., and J. F. T. Engblom. January 29th, 1931. (364,875.) (Cognate application 25,357/31.)
3,040. "Construction of dynamo-electric machinery." Brush Electrical Engineering Co., Ltd., and C. C. Sutton. January 30th, 1931. (364,877.)
4,076. "Electropneumatic pumps for massage and like apparatus." C. A. M. and H. S. Buckley. February 9th, 1931. (364,889.)
4,961. "Electric couplings for electrically heated hand tools such as curling tongs." R. Bosch Akt.-Ges. March 8th, 1930. (364,899.)
5,000. "Electric meters and testing instruments." F. S. S. Wates. February 17th, 1931. (364,900.)
5,925. "Arrangement for converting variations of the intensity of light into variations of voltage." M. Grutzmacher. February 25th, 1930. (Addition to 345,317.) (364,915.)
6,458. "Galvanic batteries." Oldham & Son, Ltd., and W. D. Wilde. March 2nd, 1931. (364,918.)
6,474. "Device for the connecting of branch wires on power current lines." A. Eggler. March 2nd, 1931. (364,919.)
6,887. "Resonance controlling devices for performing definite operations." Landis & Gyr Soc. Anon. March 6th, 1930. (364,924.)
7,293. "Electric torches, flash lamps, and the like." Ever Ready Co. (Great Britain), Ltd., and E. F. Beeston. March 9th, 1931. (364,930.)
7,952. "Electric batteries." Ever Ready Co. (Great Britain), Ltd., and A. H. Sheppard. March 14th, 1931. (364,934.)
8,299. "Apparatus for performing electrometric volumetric analyses." I. G. Farbenindustrie Akt.-Ges. March 31st, 1930. (Addition to 309,038.) (364,939.)
8,560. "Electric lamp holders." G. H. Ide and H. L. Bentley. March 20th, 1931. (364,942.)
8,888. "Electric measuring apparatus and relays." Compagnie Pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. March 21st, 1930. (364,948.)
8,896. "Thermionic amplifying circuits." Siemens & Halske Akt.-Ges. March 24th, 1930. (364,949.)
9,024. "Devices for metering the duration of telephone conversations." Telefonaktiebolaget L. M. Ericsson. March 29th, 1930. (364,952.)
1,182. "Electric heating units." British Thomson-Houston Co., Ltd. April 15th, 1930. (364,967.)
12,235. "Lighting fittings." Benjamin Electric, Ltd. May 14th, 1930. (364,976.)
13,168. "Method of making electrically insulating form pieces." Micafil Akt.-Ges. May 5th, 1930. (364,984.)
14,739. "Stripping of lead sheathings of electric cables." Felten & Guilleaume. May 22nd, 1930. (364,996.)
15,572. "Process of, and apparatus for, the electric melting of glass." L. Mellersh Jackson (Hartford-Empire Co.). May 27th, 1931. (364,999.)
15.723. "Switch for electrically heated kettles and the like." G. Pate and J. R. Laird. May 29th, 1931. (365,000.)
16.337. "Automatic starting rheostat for electric motors." R. Planche. June 25th, 1930. (365,002.)
17.371. "Mercury switches." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 18th, 1930. (365,008.)
18,390. "Thermionic amplifiers." H. W. K. de Brey. July 11th, 1930. (365,011.)
21,658. "Apparatus for the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Metallges Akt.-Ges.) July 29th, 1931. (365,018.)
22.824. "Telephone pay stations." Telephon Fabrik, E. Zwietusch Ges. August 13th, 1930. (364,022.)
22.861. "Vent valves for electric pumping installations." Maschinenfabrik a.d Sihl Akt.-Ges. Vorm A. Schmid. August 16th. 1930. (364,519.)
23,506. "Submarine electric cables." Felten & Guilleaume Carlswerke Akt.-Ges. March 21st, 1931. (365,022.)
23.832. "Connection devices for electric ignition cables." Bosch Akt.-Ges. October 17th, 1930. (364,521.)

Colour Lighting and Advertising

On January 25th the Publicity Club of London held a meeting at the Holophane Demonstration Theatre, Vincent Square, London. A demonstration was given by Mr. R. Gillespie Williams, the Holophane colour lighting consultant, on the many ways in which light and colour can be combined for advertising purposes.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Bazaar stores, Great Darkgate Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

Addlestone (SURREY).—Re-erection of factory, Alexandra Road, for the Sunbury Leather Co. (1910), Ltd.

Annfield Plain (DURHAM).—Houses (72) for the U.D.C.; surveyor, Council Offices.

Aylesbury (BUCKS).—Houses (58) for the R.D.C.; surveyor.

Ayrshire.—School, Dalblair, New Cumnock, for the County E.C.; director of education, Ayr.

Barking.—Pumping station (£38,559); Howard Farrow, Ltd.

Bedford.—Extensions, including science building and gymnasium (£25,000), for the governors of the Harpur Trust; R. L. Elgie, clerk.

Bewdley (WORCS).—Conversion of Ribbsford House into club premises (£25,000) for the 400 Club; Sir Broderick Hartwell, organising secretary.

Bexhill.—Houses and shops; J. E. Maynard, architect, Collington Avenue.

Bilborough.—Licensed premises, Broxtowe Lane, for Messrs. Hanson's, Ltd., The Brewery, Kimberley, near Nottingham; A. G. Wheeler, "Orchardleigh," Eastwood, Nottingham.

Billingham-on-Tees.—School (400 places) for the Rev. E. J. Connell.

Birkenhead.—Houses (24); R. W. Johnston, borough engineer, Town Hall.

Birmingham.—Two public houses, Weoley Castle Estate (£25,000); Mitchells & Butlers, Ltd. Shops on housing estates; B. Whitehouse & Sons (13), A. A. Howard (7), D. James (6), A. J. White (12), H. Hyge (4) and S. G. Marsh (3). Church, King's Road, Kingstanding; Wesleyan Methodist authorities. Two schools, Glebe Farm and Mill Pool Estates, for the E.C.

Blaydon-on-Tyne.—Installation of electric lighting at Crookhill and Emmaville Council Schools for E.C.

Bolton.—Houses and bungalows (79), flats (4), Cameron Street Estate; housing director, Westminster Bank Chambers, Bolton.

Bream (SOMERSET).—Church, Wesleyan Trustees; Pennington, Hostler & Taylor, architects, Pontefract.

Bridlington.—Rebuilding Royal Hall, The Spa (£60,000); borough engineer, Town Hall.

Brighton.—Houses (580), eastern section Whitehawk Estate (£196,550); borough engineer. Premises, Western Road, for Marks & Spencer, Ltd. (£24,346); Bovis, Ltd. Development of Laughan Lodge Estate as mental colony; borough engineer. Elementary school, Woodingdean, for the E.C. Hotel reconstruction, Charles Street and Marine Parade; Arlington Hotel Co. Houses (32), Bevendean Crescent; Braybons, Ltd.

Bursiem.—Development, Bycars Estate; Ford & Slater, architects.

Bury St. Edmund's.—Extensions to county offices for West Suffolk C.C.; county architect.

Cambridge.—Cinema, Sawston, for J. Spicer; G. F. Banyard, architect, 4a, Market Street.

Carlisle.—Houses (150); city engineer.

Chelmsford.—School (250 places); Catholic trustees. Library (£21,000); borough engineer.

Chester.—Houses (400), Lache Estate; city engineer.

Chester-le-Street.—New premises for the C.W.S.; C.W.S., Architect's Department, 90, Westmorland Road, Newcastle.

Clitheroe.—Two housing schemes; borough engineer.

Crewe.—Offices for the County Council (£160,000).

Croydon.—Church, Burgoyne Road and Whitworth Road; L. Stokes & Drysdale, architects, 102, Great Russell Street, W.C.1. Lifts at Town Hall for Corporation (£1,000).

Dartford.—Houses (128) for the U.D.C.; W. J. Draper & Sons, builders.

Derby.—Covered bus station with offices, café, and waiting rooms, Morledge (£15,000); borough engineer.

Dudley.—Offices for Moule & Sons, Ltd., King Street, Queen Cross; Coslett & Hughes, architects, Fountain Arcade Chambers.

Durham.—Houses (40), Parkfield Estate, Coxhoe, for the R.D.C.

Eastbourne.—New Leaf Homeopathic Cottage Hospital (£16,500); secretary.

Easteote (MDDX).—Development, Cannon Lane Estate; Rotherham Estate Co., Ltd.

Edgware.—Alterations, Children's Home (£2,500); Middlesex C.C.

Erith.—School (£46,551) for the U.D.C.

Gateshead-on-Tyne.—Modernising High Teams Poor Law Institution for the T.C. (£40,000); borough engineer, Town Hall.

Gravesend.—Public house, Cedar Avenue; Charrington & Co., Ltd.

Guildford.—Alterations to Picture Playhouse; C. A. Aish, architect.

Halifax.—Isolation hospital and houses (50) for the T.C.; borough engineer.

Hampton Wick (MIDDLESEX).—Re-erection of works for H. Robinson.

Harrow.—Development, Roxeth Estate; T. G. Smith Trust.

Hendon.—Development, Tithe Farm Estate; T. F. Nash, Ltd. Development, Camrose Estate; Camrose Estates, Ltd.

High Wycombe.—Rebuilding Disraeli Arms for T. Wethered & Sons, Reading.

Hoole (CHESHIRE).—Houses (50) for the U.D.C.; surveyor.

Honiton (DEVON).—Houses (36) for T.C. (£11,753).

Ilford.—Shops and houses (9), Clarence Terrace, and houses (6) other roads; G. F. Seigerts. Shops (3) and houses (10), Aldborough Road and other roads; Haines & Warwick, Ltd.

Kent.—Central school, Swanscombe, for the County E.C.; director of education, Maidstone.

Kidlington (OXON).—Senior schools, Gosford Hill; T. H. Kingerlee & Sons, builders, Queen Street, Oxford.

Kilmarnock.—Houses (60) for the T.C.; borough surveyor.

Knottingley.—Hotel, Upton, near Pontefract, for Messrs. Carter's Knottingley Brewery Co., Ltd.; G. F. Pennington, architect, Ropergate, Pontefract.

Lanarkshire.—Houses (28), Glenmavis and Chryston, with electrical work, for the C.C.; P. C. Smith, architect, 13, Clydesdale Street, Hamilton.

Lancaster.—Shop and offices in Main Street for Wilding & Sons; G. W. Danson, architect, 53a, Market Street.

Leeds.—Installation of electric lighting, Bramhope Parish Church; J. C. Proctor, architect, 40, Clarendon Road.

Leyton.—Clinic at White House Estate for T.C. (£6,340); borough surveyor.

Liverpool.—New school, Highfield, Broadgreen, extension to Collegiate school (£20,000); director of education, Education Offices, Sir Thomas Street.

London.—(BRIXTON).—Engine house, &c., at waterworks (£26,910); J. McKenzie, for the M.W.B. (OXFORD STREET).—Two blocks of tenements, Carlisle Street; L.C.C. architect. Extensions to Selfridges, off Oxford Street; Selfridges. Alterations to the Poland Street Garage; Walter W. Gibbings, architect, 53, Great Marlboro' Street, W.1. (POPLAR).—Reconstruction of baths, East India Dock Road (£88,259); A. E. Symes, Ltd., Stratford.

Longbenton (NORTHUMBERLAND).—Houses (100) for the U.D.C.; surveyor, Council Offices.

Maidenhead.—Houses (16), Forlease Road, for W. Yates. Garages (16) and showrooms, Grenfell Road, for Summers and Hatch.

Manchester.—Extensions to works for Pownall & Hampson, Greek Street, Brook Street, Chorlton-on-Medlock; J. E. Kewell, architect, 290, Oxford Road.

Mansfield.—Houses (20), Ravensdale Estate; borough engineer. Senior school (480 places), Ravensdale Estate, for the E.C. Factory extensions, Kirkland Avenue; Seal & Turner.

Middlesex.—Secondary school, Charterhatch Lane, Enfield (£5,627); E.C.

Morecambe.—Reconstruction of Canopy Palladium, Marine Road; Palladium, Ltd. Houses (44), Norton Grove; L. Wild, Ltd.

Northern Ireland.—(BELFAST).—Mill, for Rank, Ltd.; Courtney and Co., builders, Belfast.

Northumberland.—Council schools, Hexham (£5,285), Lowgate (£2,365), Haltwhistle (£23,000), Allendale (£6,700), and Corbridge (£14,515), for the County E.C.

Norwich.—Aerodrome (£11,750), for the T.C.; city engineer.

Nottingham.—Hosiery factory extensions, Castle Boulevard, for William Hollins & Co., Ltd.; Gilbert & Hall, Ltd., builders.

Oban.—Cathedral; Sir Giles Gilbert Scott, architect.

Oldham.—Sewage lifting and pumping plant; E. Parry, commercial manager, Gas and Water Offices, Greaves Street.

Patcham (SUSSEX).—Houses (54) and shops (4), Ladies Mile Estate; G. Ferguson.

Perth and Kinross.—Schools (£70,000); joint E.C.

Portland.—Cinema, Fortune's Well; G. A. Andrews, architect, Weymouth.

Preston.—Houses (46), Tennyson Road and Robin Street, for T.C.; A. Threlfall, builder, Leyland. Showrooms and office block, Corporation Street, for Crokson's, Ltd.; F. Dickinson, architect, Wolseley Avenue, Fleetwood.

Ramsey (I.O.M.).—Secondary school (£20,000) for I.O.M. Education Authority.

Ramsgate.—Houses (22), for the T.C.; J. Fluck, borough surveyor.

Ross.—Houses (24) for U.D.C.; J. C. Tickle, architect, Letchworth.

Rotherham.—Alterations to tuberculosis dispensary (electric lighting); West Riding architect, County Hall, Wakefield.

St. Austell (CORNWALL).—Reconstruction of St. Austell Bay Hotel; Sir G. Collins, managing director.

Salford.—Flats (250), Seedley Road; H. Fairhurst, architect.

Sheffield.—Aerodrome, Coal Aston; City Council.

Sittingbourne and Milton.—Electrical plant for the Joint Hospital Board; T. W. Ellis, consulting engineer.

Southgate.—Pavilion, Powys Lane; N. Pearson. Houses (42), Huxley Estate; G. W. Newman. Flats (24), Grove House Estate; P. Cutbush.

Staffs.—Extensions, Stafford Mental Hospital, for the Mental Hospitals Board; E. Joy, clerk, Stafford.

Stanley (DURHAM).—Houses (50), Moor House Estate; S. Grove, clerk to U.D.C., Pearl Chambers, East Parade, Leeds.

Stirlingshire.—Improvements to Kilsyth Hospital (£1,000); medical superintendent.

Stoke-on-Trent.—Housing scheme (35 acres), Abbey Hulton; Sutton trustees.

Sussex.—Girls' secondary school, Hove, for East Sussex E.C.; county architect, Lewes.

Swindon (WILTS).—School, Pinehurst, for the Borough E.C.; director of education.

Tendring (ESSEX).—Houses (100), for the R.D.C.; surveyor.

Thirsk (YORKS).—Houses (112), for the R.D.C.; surveyor.

Todmorden.—Senior school, Walsden; director of education.

Tunstall.—Development of estate off High Street; Wood and Goldstraw, architects.

Wakefield.—Hospital (£62,000), for Corporation.

Weetslade (NORTHUMBERLAND).—Houses, Dudley and Aniteford, for U.D.C.

West Monkseaton (NORTHUMBERLAND).—Two new stations for L.N.E.R. Co.

Weymouth.—Houses (62), for the T.C.; borough surveyor.

Whitby.—Extensions to X-ray and electrotherapy department, Cottage Hospital; A. E. Young, architect, 77, Baxtergate.